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MEDICAL AND SURGICAL REPORTS

OF THE

BOSTON CITY HOSPITAL.

Fifteenth Series.

EDITED BY

HERBERT L. BURRELL, M.D., W. T. COUNCILMAN, M.D.,
AND CHARLES F. WITHINGTON, M.D.

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1905.

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PREFACE.

Last year the report was not published, as some of the contributors failed to furnish the manuscript that they had promised. This year there has been generous and prompt co-operation by the Hospital Staff, and it is hoped that the report may be published annually.

The illustrations for the report are paid for by the Alumni Association of the Boston City Hospital, who have generously placed at the disposition of the editors a sum of money.

The editors wish to acknowledge their indebtedness to Dr. W. C. Howe, who has attended to the details of the publication of the report as it was passing through the press.

W. T. COUNCILMAN, M.D.
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CONTENTS.

		PAGE.
I.	GLANDERS IN THE HUMAN SUBJECT: ITS CLINICAL FEATURES AS SHOWN BY THE RECORDS OF FIVE CASES. By Abner Post, M.D.	1
II.	REPORT OF RECENT CASES OF CEREBRO-SPINAL MENINGITIS. By Charles F. Withington, M.D.	8
III.	A CASE OF DIFFUSE GLIOSIS OF THE CEREBRAL WHITE MATTER IN A CHILD. By W. N. Bullard, M.D., and E. E. Southard, M.D.	19
IV.	SIXTY CASES OF EXTRA-UTERINE PREGNANCY. By F. S. Newell, M.D.	26
V.	OXYURIS VERMICULARIS IN THE VERMIFORM APPENDIX. By Samuel T. Orton, M.D., Acting Second Assistant in Pathology	34
VI.	MULTIPLE PRIMARY HETEROGENEOUS TUMORS. By Paul A. Lewis, M.D., Second Assistant in Pathology	36
VII.	A CASE OF DIABETIC COMA, WITH RECOVERY UNDER ALKALINE TREATMENT. By George G. Sears, M.D.	41
VIII.	RUPTURE OF THE INTESTINE. By F. B. Lund, M.D.	49
IX.	INVERSION OF THE UTERUS, WITH REPORT OF TWO CASES REPLACED BY LAPAROTOMY. By L. V. Friedman, M.D.	65
X.	A CASE OF IDIOCY IN A CHILD WITH CYSTIC HEMISPHERES. By W. N. Bullard, M.D., and E. E. Southard, M.D.	77
XI.	GASTRIC AND DUODENAL ULCER. By Edward M. Buckingham, M.D.	87
XII.	EIGHT CASES OF EXTREME HEART HYPERTROPHY. By Samuel T. Orton, M.D., Acting Second Assistant in Pathology	99
XIII.	A SERIES OF CASES OF RENAL SURGERY. By Francis S. Watson, M.D.	106
XIV.	A STUDY OF THE GASTRIC CONTENTS IN TWENTY-ONE CASES OF TABES, IN THREE CASES DURING GASTRIC CRISES. By M. P. Smithwick, M.D.	122
XV.	A CASE ILLUSTRATING THE VALUE OF PERSISTENT CONSERVATISM IN THE TREATMENT OF UNUNITED FRACTURES OF THE LOWER LEG. By George H. Monks, M.D.	130
XVI.	CHORIO-EPITHELIOMA IN A PREGNANT UTERUS; RUPTURE OF UTERUS; ACUTE HEMORRHAGE. By Ernest B. Young, M.D.	138

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		Page.
XVII.	Tuberculosis and Related Diseases of the Lungs in the Medical Out-Patient Department. By W. H. Robey, Jr., M.D., and R. C. Larrabee, M.D. .	146
XVIII.	Stone in the Ureter: Report of a Case. By Joshua C. Hubbard, M.D.	156
XIX.	Mortality after Operations of Election. By L. R. G. Crandon, M.D.	159
XX.	An Arterio-Venous Aneurism of the Thigh. By Herbert L. Burrell, M.D.	162
XXI.	A Case of Pott's Disease in the Monkey. By E. E. Southard, M.D.	166
XXII.	Note Upon an Accessory Pancreas in the Intestinal Wall. By Paul A. Lewis, M.D., Second Assistant in Pathology	172
XXIII.	Review of Mastoid Cases Operated in Aural Service of Boston City Hospital, October, 1903, to May, 1904 (Inclusive). By George A. Leland, M.D.	173
XXIV.	Malignant Disease of the Lungs and Pleura. By Henry Jackson, M.D.	200
XXV.	Studies on the Pneumococcus. By Charles W. Duval, M.D., and Paul A. Lewis, M.D. . . .	212
XXVI.	Operative Treatment of Old Fractures at Lower End of Radius. By Howard A. Lothrop, M.D. .	221

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I.

GLANDERS IN THE HUMAN SUBJECT: ITS CLINICAL FEATURES AS SHOWN BY THE RECORDS OF FIVE CASES.

By Abner Post, M. D.

A case of glanders has recently occurred in the hospital, under my care, which has illustrated the ease with which the true cause of the symptoms may be overlooked.

Search through the records has discovered only five cases recorded since 1864, the year the hospital first received patients. They are given here somewhat at length, as no other means could better show the varied clinical aspects of the disease. Further, they show that the disease often first involves the lungs in a manner which cannot be distinguished from an ordinary lobar pneumonia. Such an inception would seem from these cases to deserve more emphasis than is given it in the generally received accounts of the symptoms. The cases are given in the sequence in which they occurred, and the clinical details are the only ones emphasized.

A quotation from Councilman's most admirable article in Wood's Handbook is peculiarly applicable to this series of cases:

"Taken in its entirety the clinical history of the disease, both in the acute and chronic form, is almost characteristic, but at a given period, and indeed for a long time, it may be impossible to make the diagnosis. This is particularly true of the chronic form."

A condensation of Councilman's further description forms a basis for comparison and thus renders these histories more interesting and valuable:

"The skin lesions which are so prominent in the horse appear in man only in the later stages of the disease, and abscesses in the muscles (which

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are very rare in the horse) are common in man and often constitute the first evidence of the disease. The acute disease begins in man with chills and high fever, which sometimes take a typhoid form. There is often intense pain in the joints and muscles with general weakness and malaise. This condition is followed by the development in the muscles or subcutaneous tissue of hard swellings, which rupture and discharge a thick mucoid pus mixed with streaks of blood. . . . In some cases there is a diffuse erysipelatous inflammation of the skin preceding the formation of pustules, or large ulcers may be formed by necrosis of the skin.

"The nasal discharge is not so marked as in the horse, but an examination of the mucous membrane will rarely fail to show nodules, ulcers and diffuse swelling. The muscle abscesses are usually present. The pustules are most common toward the termination of the disease and often appear only just before death. This acute form is almost invariably fatal, death taking place usually between the sixth and thirtieth day of the disease.

"The chronic form may have a duration of several years. In these cases there is usually an infection from a local lesion of the extremities. Later, abscesses appear in the subcutaneous tissue or in the muscles. In nearly all the chronic cases reported the disease passed into an acute form a short time before death."

The histories show that all these symptoms do not occur in all cases, and that the difference between the acute and chronic cases may be a very marked one. It may be suggested that inoculation may take place through the air passages, the digestive tract, or through a lesion of the skin, and that the early symptoms may differ according to the locus of inoculation.

Case No. 1. — William Curley, Charlestown, twenty-three years old, hostler, entered the hospital on August 11, 1885, in the service of Dr. Forster. Two weeks before entrance had diarrhœa, anorexia and general malaise. Five days ago had a sharp cutting pain in the left side. Cough and a full breath still cause pain. There was some headache, nausea, vomiting and slight expectoration. Temperature on entrance 101.2, pulse 108, respiration 24; face bathed in sweat.

August 15. It is noted that there was slight dulness in left chest, with diminished respiration. On the left side next the spine, between the ninth and twelfth ribs, is an area which is tender and slightly bulging. A similar area exists in the anterior axillary line.

August 21. His hand was swollen and there was pain also in left foot.

August 22. An abscess in the left calf was opened, with a free discharge of bloody pus, and a few small pustules were forming. The next day the pustules were more numerous, varying in size from the head of a pin to a small pea.

During this time the temperature had varied between 102.5 and 105.

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On the 23d, temperature was 106.5, pulse 146, and respiration 55 ; and there was a sero-sanguinolent discharge from the nose. More pustules had appeared and their edges were hardened.

The patient was transferred to the surgical service of Dr. Bradford, where he gave the following amended history: About twenty-three days ago began to feel sick. At and before this time he had the care of a horse which was sick and had a discharge from the nose and mouth. Was not careful about his hands, and pulled and scraped away the discharge from the horse's nostrils with his fingers. Was sick in bed four days before entrance on August 11. He showed, on the 23d, profuse perspiration and dried discharge about nostrils.

Condensation of the records allows us to say that pustules began to show, few in number, on the fourteenth day of disease. Subcutaneous abscess had shown earlier. There were present papules, vesicles, pustules, ulcers from rupture of preceding lesions, first round and size of pea, later much larger and irregular from the running together of separate ulcers, and surrounded by smaller ulcers.

Died on the 25th, about twenty-five days after the first symptoms. Some time before death a bacillus was found by Dr. Ernst in the discharge from one of the sores, which coincided with the bacillus of glanders. This was probably the first case in Boston in which the bacillus was recognized in the human subject.

At the autopsy an incision in the swelling to the left of the vertebral column revealed extensive infiltration, with pus in the deeper muscular layers, and between the ninth and tenth ribs an opening communicated with the cavity of the thorax. The pleural surfaces on both sides were adherent anteriorly and laterally by numerous fibrous bands. The lungs retracted but little on removal of sternum ; were dark in color, denser and less crepitant than usual. On section the surface throughout was moist, rather dark in color, yielding on pressure a large amount of thin, aerated fluid, also here and there drops of pus. The larger and medium-sized bronchi contained thick, muco-purulent fluid ; the mucous membrane slightly reddened and injected. In the posterior middle portion of the upper right lobe were two firm, grayish-red nodules, about the size of walnuts, showing on section a reddish granular non-aerated surface. (Acute broncho-pneumonia.)

Case No. 2. — Alden Snell, fifty-four, a livery stable keeper, entered hospital April 30, 1887. Has not been perfectly well since January, when he took cold, but had no cough. After this felt feverish every afternoon. Had been gradually gaining until ten days ago, when he went out of doors. The following night he had severe pain in back and headache. The feverishness returned in afternoon worse than ever. Now complains of general weakness, headache and constipation. Temperature, 102 ; pulse, 120 ; respiration, 28. May 4 he began to complain of pain and soreness in muscles of left thigh, and also over the second right metacarpal bone.

He evidently suggested typhoid, as the record reports no rose spots nor enlargement of the spleen.

On the 11th, it is reported that he had failed rapidly, had had a few involuntary dejections and some vomiting, and pain in the legs. There was a slight erysipelatous blush on his nose and right cheek, with

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marked puffiness of the whole face. Several small pustules were scattered over left arm, face and head, also several small swellings one-half inch in diameter.

On the 12th, copious pustular eruption nearly all over body; a few of the pustules hemorrhagic.

13th. Blebs becoming hemorrhagic. Area of erysipelatous blush not increased in size, but much deeper in color, mostly covered with purpuric pustules.

Died on the 14th.

The autopsy report speaks of the eruption as most abundant and largest over face, in places confluent. Also seen on anterior surface of the chest, arms and thighs. There were also nodules in frontal region growing from the periosteum, ranging in diameter from 5 to 10 mm., of grayish appearance and red periphery.

The investigation of the nasal cavity from behind showed reddening and injection of the mucosa, also several superficial ulcers with grayish bases and reddened infiltrated edges varying in diameter from 3 to 10 mm. Sections through them showed that they consisted of grayish, rather soft nodules of new growth, involving wholly the mucosa as far as the bone. Section through the nodules in the skin showed that the superficial portion was a vesicle with fluid lying below epidermis, below this a spherical grayish nodule of new growth varying in size from a hemp seed to a filbert. The larger ones slightly flattened.

The pathological diagnosis was multiple granulomata of the skin, of the pericranial connective tissue and of the nasal mucous membrane. Cloudy swelling of the kidneys. Injection of the spleen. Glanders. No mention is made of bacteriological finding. Duration of disease about three months.

Case No. 3. — Abraham Hertzburg, a Pole, thirty-two, merchant, entered the hospital on January 16, 1893, in the service of Dr. Folsom. The patient entered at the end of the second week of his disease, with swelling, tenderness, and redness of ankles, right knee, left elbow and wrist, and tenderness of left knee and left shoulder.

Scattered over entire body, except the back, were numerous large and small vesicles, surrounded by a reddened zone, and numerous pustules and papules, some scales and crusts. Eruption increased rapidly in number of pustules and size of crusts. Respiration became labored. There was a slight purulent discharge from one nostril and a beginning edema of both eyelids, and he died January 18. There was no autopsy and no record of any bacteriological examination. There was no mention of possible sources of infection.

Disease lasted about sixteen days.

Case No. 4. — Nathan W. Ward, fifty-nine, letter-carrier. "Has recently been in contact with glandered horses."

Entered the hospital October 29, 1904. Six days previous, had had a sudden chill, lasting one hour, followed by sweating and fever. Vomited several times the first day, not since. Pain at once set in in right chest; worse on deep inspiration, slight cough. Expectoration slightly blood-tinged. On entrance, pain in side severe, prostration considerable, temperature 104, pulse 115, respiration 45. Considerable dyspnea, slight cyanosis.

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Left lung showed slight dulness at base in axillary line with broncho-vesicular breathing, no râles.

Right lung showed dulness, becoming flatness below fourth rib in front, and flatness behind and in axilla from angle of scapula to base. Over this area intense bronchial breathing with increased vocal and tactile fremitus and egophony. Marked increase of whispered voice sounds. Many fine and subcrepitant râles.

November 1. Signs of consolidation had diminished, but temperature continued about 104 and the pulse had risen to 140. The first mention of cutaneous lesions occurs in the notes of this day to the effect that two days previous the little finger of the left hand showed redness, swelling and tenderness. One small pustule appeared on the right hand and two on the neck. Twenty-four hours later the left foot was swollen and red, the big toe bluish. Pustules appeared on the left upper arm. Since then these have spread. They are diffusely scattered, varying in size, irregular in shape, with a sero-purulent discharge.

Seen by two consultants, one of whom gave a diagnosis of impetigo contagiosa, the other of septicemia.

November 2. Skin lesions multiplied rapidly. Patient died at 7.30 A.M.

Disease fatal in about ten days.

Autopsy. — Dr. Wolbach's description of the external surface is extremely interesting:

The whole body, including face and scalp, is covered by an eruption, macular, papular, vesicular, pustular. Papules are small, brownish in color, from 1 to 4 mm. in diameter. Pustules vary from a few mm. to 1 cm. in diameter and are umbilicated. In places there are ulcerations surrounded by vesicles, the whole upon elevated, dark-red indurated bases. These lesions are most numerous over the chest, sides of the neck, upper arms and thighs. Are thinly scattered over lower legs, forearms, face and scalp. On left frontal eminence is an ulceration 1 cm. in diameter surrounded by vesicles. Over right eminence are two similar ulcerations upon a common elevated base. On right temple is an irregular ulcerated area 3 by 4 cm. also surrounded by vesicles. On right upper arm are several smaller lesions. Over right zygoma a conical-shaped pustule 1 cm. in diameter at the base. The lesions on sides of the neck are mostly pustular. The lesions on sides of chest and over lower legs and forearms are papular. These papules are hard to the touch. Over both radii in the upper third of the forearm are abscesses each containing about 40 c.c. of thick sanguinolent purulent matter. Over anterior aspect of thigh is a smaller abscess. Little finger of right hand is swollen and dark reddish in color. Left little toe similar.

Autopsy findings:

Resolving pneumonia (right).
Fibrous pleurisy (right).
Abscess of lung (right).
Multiple subcutaneous abscesses.
Pustular and papular skin lesions.

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Acute hemorrhagic leptomeningitis (right).
Acute cellulitis of the scalp.

The bacteriological examination of Duval and Lewis * showed that the blood culture taken two days after admission yielded a pure culture of B. Mallei. Cultures from the abscess of the lung, the scalp and the arms and thigh showed B. Mallei mixed with streptococcus pyogenes and staphylococcus aureus.

The following case, the last one in the sequence, is my own, and furnishes the excuse for putting the other cases together. It is decidedly a chronic case, and is not yet finished. It lacks the striking phenomena of the previous acute cases, but there is similarity between the subcutaneous abscess in this and some of the preceding cases.

Case No. 5. — It is somewhat remarkable for the slight character of the symptoms and the difficulties of the diagnosis. It has led to the study of the previous cases, and is put on record in the hope that it may help in the recognition of other cases. This patient had no discharge from the nose, no eruption on the skin, and was not especially sick.

Jeremiah Barry, twenty-two, 21 Austin street, entered the hospital on January 29, with a small indurated and tender spot on the outer posterior aspect of the left leg, and a small fluctuating tumor, size of a walnut, over the upper portion of the sternum. The patient was convalescent from a pneumonia three weeks previous. He had a temperature of 102 and a pulse of 100. The abscesses were opened under ether the next day. They contained a bloody, purulent fluid. The one in the leg was reported as containing streptococci and that over the sternum as sterile. The temperature fell to 100 and the pulse to between 80 and 90.

The middle of February the little wounds were still unhealed, other small areas of tenderness had formed, and the temperature was still running about 100. The first of March still other foci had shown themselves, the temperature had shown some slight decrease, but the patient was still in bed, somewhat listless and indifferent.

The abscesses were characterized by slight tenderness and very little swelling, and their contents were thin, bloody, with little pus. They were not frankly inflammatory. They were tender rather than painful. After opening and cleansing they showed little tendency to heal.

About the middle of February it was remarked that the slight abscesses were not healing in normal fashion; that new abscesses were constantly forming; that these abscesses were not frankly purulent, but were somewhat peculiar; that there was continuous elevation of temperature and languor greater than the local lesions would explain. It was evident that there was some serious constitutional condition of

* The Journal of Medical Research, August, 1905, page 54.

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which the clinical expressions were those mentioned above. No organic internal disease could be discovered. The blood was cultivated without result. The question was then raised whether it was possible that the patient was suffering from glanders, as something answering to the bacillus had been found, but it had failed to give the characteristic reaction in the guinea pig.

With that hint, the patient gave us a history of great value, somewhat as follows: He was a longshoreman, but work being slack he had obtained work in a large stable, where he had worked for a week when he was taken down with pneumonia. During that week he helped in the care of twenty-one horses. Two horses, not directly under his care, but into whose stalls he had been, were killed by the Board of Health for glanders.

The patient was sick with "pneumonia" for three weeks when he returned to the stable, but in a few days the abscesses obliged him to give up work.

With this history in view, further bacteriological research was undertaken, and the undoubted existence of glanders demonstrated.

The patient continued to develop abscesses, but improved greatly in general condition and was discharged from the hospital early in June. His condition since leaving the hospital is unknown. This case illustrates the fact that the surgeon cannot rest the responsibility of diagnosis upon the pathologist alone.

This case has lasted about nine months.

When clinical surgeons are obliged to depend upon others for pathological and bacteriological work, it is evident that they must know what sort of pathological or bacteriological process is capable of producing the symptoms which attract their attention, that they may indicate the character of the research to be undertaken.

Three of these five cases had definite symptoms of involvement of the lungs, and another complained that his trouble began with a cold. So far as these few cases have weight, it would seem that an initial pneumonic process must be more frequent than is usually believed.

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II.

REPORT OF RECENT CASES OF CEREBRO-SPINAL MENINGITIS.

By CHARLES F. WITHINGTON, M.D.

This disease is never entirely absent from the city, but the present year a considerably larger number of cases has been known than during any other year for the past seven years. The number of admissions to the City Hospital for cerebro-spinal meningitis during the last seven years has been as follows:

1898	45	cases,	with	33	deaths.
1899	19	"	"	14	"
1900	8	"	"	4	"
1901	13	"	"	12	"
1902	4	"	"	2	"
1903	7	"	"	7	"
1904	23	"	"	15	"

As the greatest prevalence of this disease is in the spring months, the cases herein considered, which occurred in the first half of the year 1905, will probably represent practically the entire incidence of the disease for this year. Indeed, no cases have occurred since the 1st of July, at the time of writing (September 20).

The number of cases of cerebro-spinal meningitis, excluding tubercular, pneumococcic and other infections, have been thirty, and the Trustees having decided to concentrate all these cases into the Third Medical Service, with separate house officer and nurses, the majority of them fell under the care of the writer. There were twenty-one deaths. The shortest period of the fatal disease was one day, and the longest five weeks. The average period of the fatal cases was from three to five days. In the cases which

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recovered, the shortest period was twenty-three days before the patient was discharged, and the longest eighty-two. The oldest patient was forty-five and the youngest seven, so that these hospital cases may fairly represent the character of the disease in the city at large except among infants. There were twenty-two males and eight females.

The onset of the disease in typical cases was, as usual, very sudden. For example, a girl of twenty-three became suddenly dizzy and fell unconscious in convulsions, had rigidity of the neck, and died on the fifth day.

A man of twenty-two was absolutely well until 3 A.M., when he was taken with violent vomiting and pain in his head and bowels. He arose the next morning and worked until 11 A.M., then went to bed vomiting again, and died at 6 A.M. the following day.

A man of twenty had had slight headache for twenty-four hours and had been a little irritable, but went out and spent the evening with friends. The next morning he was found semi-conscious and delirious, and died the following day.

On the other hand, some of the cases began more gradually. A fireman, aged thirty-six, had been poorly for ten days. Stopped work three days before admission. Had vomited for two days. On the morning of admission seemed to be quite well, but in afternoon had sudden intense pain in head and back; became unconscious in ten minutes; was alternately delirious and comatose, and died the next day.

Delirium was an early and prominent symptom, in some cases preceding any other except pain in the head. Rigidity was present in all cases, and retraction in the great majority. In one patient, a girl of fourteen, the most extreme retraction was noted of any in the group, the head being at an angle of more than 90° with the spine, yet the patient recovered. Convulsions occurred in five of the patients, all adults. The majority of these died, but in at least one case where convulsions were present, in a patient of twenty-four, the patient made rather an early recovery. Vomiting was in many cases the first symptom, and, in a case previously referred to, it waked the patient in the night. Diarrhœa was exceptional, but occurred in one patient in connection

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with early vomiting. Chills were often an early symptom, and these were frequently multiple and succeeded by a high temperature. The temperature ran, in ordinary cases, to 103°, and in the severer ones to 106°, and was irregular in type. The pulse was, as usual, not commensurate with the temperature. Eruption was present in nine of the fatal cases and two of the non-fatal cases. It was usually fairly extensive, petechial in character, and most abundant upon the legs and abdomen. In one case there were large ecchymoses. Ear symptoms were observed in only one patient, and in his case sudden deafness was one of the first manifestations of the disease. This was better the following morning, but was followed by recrudescence of all the symptoms.

Eye symptoms were much more frequent. Unequal pupils were observed in two patients, conjunctivitis of moderate severity in two, conjunctival hemorrhage in one, strabismus in two, ptosis in one, and in one patient a rapid panophthalmitis occurred. This was in a man of twenty-six. He had entered in a somewhat confused state mentally. He thought that he had been in bed for three or four weeks; gave no connected story. There was a chill at the beginning. He was apathetic and semi-conscious, and many of his answers were meaningless. Pupils equal and respond. Left eye shows marked conjunctivitis. Neck rigid, but not retracted. Double Kernig sign, and some macular eruption on both sides of chest and both legs and feet. The white count was low; afterwards rose to 11,000. As the patient became clearer, he informed us that the soreness of the eye began the day following the onset of his sickness. Two days after admission, the left eyeball was evidently filled with pus. Dr. Greenwood saw him in consultation, and reported panophthalmitis of the left eye. Cultures taken inside of the left lid showed only staphylococcus, pyogenes albus and aureus; no meningococcus. The Kernig sign and rigidity disappeared at the end of about a week, and he was discharged on the thirty-fourth day from his entrance, the ophthalmologist saying that while the eye was useless, as it caused no pain or other disturbance, enucleation would not

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be necessary. As the eye lesion began almost instantly with the meningitis symptoms, one may wonder whether the conjunctiva was not the port of infection to the meninges.

The double Kernig sign was present in many of the cases. The Babinski reflex was exceptional, but occurred on both sides in one or two cases. In one case, having been noted as absent, it subsequently developed under observation.

The heart in several instances showed marked weakness late in the disease. In one case, that which died at the end of the fifth week, death was apparently due to myocardial degeneration. This patient, a professional ball player, entered April 8, appeared convalescent on April 28, and sat up from May 3 to the 5th, after which his temperature rose and he began to vomit. After being put back to bed he again became better, got up for a short time on May 12, but grew weak afterwards, and complained of headache and faintness, and died May 16.

A boy of fourteen, who had entered unconscious, with great retraction, flexion of legs, etc., was left with a rapid heart, and on sitting up complained of anginoid pains, also accompanied by intense spinal pain. He was discharged well, however, on the eighty-second day after admission.

Pneumonia had preceded the meningitis by four weeks in one fatal case, and coincided with the meningitis in another. In both of these lumbar puncture showed the diplococcus and not the pneumococcus to have been the organism responsible for the meningeal affection. Other cases in which the pneumococcus produced the meningitis will be spoken of later. Cheyne-Stokes respiration was the final symptom in one case.

Two cases were said to have been second attacks, though the accuracy of the diagnosis in the original cases cannot be verified. The mother of the boy of fourteen says that he had meningitis seven years ago, recovered after two weeks, and has been well since. A woman of twenty-five states that she had a similar attack to the present one a year ago. The former patient recovered; the latter died.

Mental symptoms following meningitis were noted by the writer in a non-hospital case occurring during this time, as

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follows: A young woman of twenty-nine, seen with Dr. Blair of Dorchester, had a subacute attack of meningitis, with irregular fever which had been running for eighteen days. A lumbar puncture on the twenty-first day gave sterile fluid, as is sometimes the case late in the disease. The only question of diagnosis was between cerebro-spinal and tubercular meningitis. After the severity of the meningeal symptoms had passed she became maniacal, and was sent to the insane hospital, where she remained for two months, and then was discharged well, the result proving apparently that it was not the tubercular variety of the disease.

Remissions in the course of the disease were observed several times, the patient appearing better, and again developing anew increased rigidity, retraction and delirium.

The white blood count was made in most of the cases and showed invariably an increase in the white corpuscles, about equal in the fatal and non-fatal cases, the highest figures noted being 44,000 in a fatal and 44,800 in a non-fatal case. In eight cases the leucocytes were between 11,000 and 20,000, in nine between 20,000 and 30,000, and in five between 30,000 and 40,000. In one instance a progressive leucocytosis was noted, viz.: 15,000 on the seventh day, 20,000 on the eighth day, 28,000 on the tenth, 36,000 on the twelfth. The differential count showed no disturbance in the ordinary proportions of the leucocytes, the following representing an average count: polymorphonuclears, 86 per cent.; mononuclears, 13 per cent.; eosinophiles, 1 per cent.

Autopsies were obtained in seven of the fatal cases, and presented, in almost all cases, the picture described in the monograph of Drs. Councilman, Mallory and Wright of 1898; exudate involving pia of base and vertex, extending downward more or less upon the sheath of the cranial nerves; also abundant in the sulci, in the islands of Reil and on the anterior and posterior surfaces of the cerebellum; also at the base of the skull and about the optic chiasm and surface of the pituitary body, the two hemispheres in places being glued together. The turbinate bones, nasal septum and floor of the nose were in one case covered with a yellowish-green

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puriform deposit. The left antrum of Highmore contained about one cc. of yellowish-green puriform matter. In another the posterior nares and turbinates were covered with thick purulent secretions, showing the intracellular diplococcus. The spinal cord in most cases showed the same exudate of yellowish-green, tenacious, gelatinous material over a large portion of its extent. The ventricles contained cloudy fluid with a drop of pus in the descending horn.

Lumbar punctures were made in eleven fatal cases with positive results, and there was one dry tap. In the non-fatal cases they were made four times, and there was one dry tap, the specific organism, the diplococcus intracellularis meningitidis being recovered in all cases. In two or three cases an immediate and marked amelioration of symptoms resulted from the tap. In one case especially, a girl of seventeen, who had had a subacute illness of over a month's duration, which was at first believed to be associated with delayed menstruation, a puncture was made, with a free flow of blood from the needle. This was the only hemorrhage I have observed from lumbar puncture in cerebro-spinal meningitis. No untoward symptoms followed, and she passed a good night, with no hypnotics. Two days later another puncture was made at the same level, but on the opposite side of the vertebra, and about an ounce of opalescent, slightly purulent fluid withdrawn. Her temperature, which before had been 102°, was now 99°, the rigidity of the neck became less, and with the exception of occasional vomiting for the next ten days the patient had no ill symptoms, and was discharged well. Good temporary results followed in some other cases, but with a later recurrence of previous symptoms, which were then unrelieved by further puncture. In other cases no relief was seen. One or two cases are noted where a dry tap was made, the needle appearing to enter the spinal canal. A subsequent tap withdrew characteristic turbid fluid.

That an occasional error may arise from the evidence of a clear fluid is illustrated by a patient of twenty-five in whom lumbar puncture was made and 5 cc. of clear limpid fluid withdrawn, which failed to show meningococcus or

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tubercular bacilli. Four days later, a second lumbar puncture withdrew 35 cc. of cloudy fluid which showed meningococcus.

Cultures from the nose were positive in two cases, showing meningococcus from the swab. In one case only, a blood culture showed according to the report of Dr. Wolbach, pathologist, "a micrococcus, culturally and morphologically identical with diplococcus intracellularis meningitidis."

It seems probable that, as in the case of pneumonia and other infections, something besides the mere presence of the organism is necessary to put it into virulent relation with internal structures.

As a contributing factor in the etiology, possible traumatism is shown in a boy of seven who jumped from a shed while playing, apparently receiving no injury. The following day there were pains in the legs and vomiting, and the next day sudden severe headache, unconsciousness, convulsions and rigid neck. On lumbar puncture the fluid spurted out, showing high tension. 40 c.c. of turbid fluid were removed, containing meningococcus. The patient died.

Alcoholism was present as a factor in several cases. In one, a man had been drinking heavily for several days, but his sister said that when she saw him the day before admission he was not sick. The following morning he was found unconscious and brought in by the police. The next day there was marked general rigidity, stiffness and retraction of neck and clouded intellect, with occasional lucid intervals in the next two or three days. Lumbar puncture positive. Died on the fourth day. Autopsy and cultures showed the characteristic appearances of cerebro-spinal meningitis.

As to treatment: The therapeutic value of lumbar puncture in some cases seems to have been marked, and irrespective of considerations of diagnosis it should be performed in severe cases. The injection of antiseptic (corrosive sublimate, lysol, etc.) into the spinal cord was not practised. The only new treatment employed was the use of diphtheria antitoxin, in accordance with a recommendation made early in the year by Dr. Arthur J. Wolff, Bacteriologist of the Hartford Board of Health, and following similar treatment applied in some of the New York hospitals. No special

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effect could be fairly assigned to the antitoxin injections, which were given in nine fatal and two non-fatal cases. The amounts given were large, the minimum being 8,000 units and the maximum 48,000. The latter was used in the case previously referred to which, after relapses, died the fifth week. No deleterious effect from the injections was noted, but in a few cases the usual urticaria was produced. The treatment otherwise was symptomatic. In a few cases of convulsions or great rigidity, warm baths were used.

As to the question of contagiousness of this disease, the writer concurs with a recent paper by Dr. Buckingham, from which it appears that there is little danger of its direct transmission to other persons. The well-known weak viability of the organism outside the body is in accord with this view. In only one case in the series could the theory of direct contagion be entertained. This was a house officer who had recently carried a tube containing cerebro-spinal fluid to the laboratory. In his case the onset was sudden and the course brief. The existence of the meningococcus was determined by a post-mortem puncture of the spinal canal, but the direct connection with the previous case is not clearly demonstrated.

The case of an orderly, which was supposed to be one of contagion, is of interest as showing the possibility of a mistake. This man had been in recent attendance upon a meningitis case, and was admitted as a case of meningitis. The diagnosis at first appeared to be strongly probable. He was taken suddenly ill with delirium and vomiting and had pain up and down his back; no convulsions. Entered with intense headache and pain in the back; neck rigid and tender, but not retracted; temperature, 103°; white count, 33,800. There was at the time of entrance no other sign of disease on physical examination. Two days later, however, he developed a friction rub in the left chest, without bronchial breathing, the neck still being rigid. Two days later, marked dulness of the left upper lobe; numerous râles of large character; increased voice sounds; increased fremitus; sputum bloody, but contained no tubercle bacilli. Lumbar puncture made on this day withdrew clear fluid, which proved to be

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sterile. The following day his temperature was lower; physical signs of consolidation well marked. Two days later the white blood count had fallen to normal, and resolution of the pneumonia followed, with complete recovery. The question of a pneumococcus infection of the meninges in this case naturally arises, but the absence of any evidence of it in the cerebro-spinal fluid, and the fact of his recovery, discredit such a diagnosis.

To the foregoing cases we may add two cases of meningitis in which the organism was not meningococcus, and these cases are of sufficient interest to be briefly reported.

William H., twenty-six, single. February 22, 1905. Habits alcoholic. Typhoid four years ago. For three months has had a cough, failure of strength and flesh; no sputum. Hemorrhages from the nose every two or three months for several years.

Worked till four days ago, then chill and sudden deafness. Better next morning on waking, but in afternoon severe frontal headache. No vomiting; mind hazy. This morning sudden violent delirium, and incontinence of bladder and rectum.

Physical examination showed neck and spine very rigid. Unconscious. Examination of chest unsatisfactory, owing to delirium. A loud double systolic and diastolic murmur heard all along the sternum. No thrill over heart, but one over arteries of neck. Corrigan pulse. Marked pulsation of peripheral arteries. Pistol-shot sound down femoral artery and as far as posteria tibia.

A diffuse abscess over dorsum of foot. Double Kernig sign. Knee jerks equal, lively; no clonus nor Babinski.

Patient moribund on entrance, and died the same afternoon.

Autopsy eight hours post-mortem, showed acute fibrino-purulent pericarditis, in myocardium about base of aortic valve an irregular cavity containing yellow purulent fluid. Acute endocardial vegetations of the aortic cusps, and from the base of one of these a soft ecchymotic area extending outward and downward under the mural endocardium. A well defined area of pneumonic consolidation was found in the right upper lobe about 6 cm. in diameter.

The spleen was acutely enlarged, and the ecchymosed spot on the dorsum of the right foot was found filled with clotted blood, evidently a septicemic manifestation to be interpreted in connection with the endocarditis and acute splenitis.

The dura mater was tense, the pia everywhere injected, cloudy and moist with plastic or semi-fluid exudate. Frank pus, most marked in dollar-sized areas over both vertices behind frontal pole in an area 4 cm. in diameter over left angular gyrus, over and under both opercula and in the interpeduncular space.

Cortex showed no gross evidence of suppurative involvement. The ventricles contained an increase of cloudy fluid, with several cc. of

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fibrinous pus in the posterior corona. Ependymitis marked in 4th, 3d and anterior portions of lateral ventricles.

The mucosæ of the frontal sinuses were injected and velvety, the sphenoidal sinuses and the ethmoidal cells contained much mucus and pus.

The pia mater of the cord was extensively involved in deep fibrinous exudate, the fluid of the subdural space cloudy.

The following organisms appeared from the respective cultures:

Heart blood . . . . . staphylococcus.

R. lung . . . . . { staphylococcus. pneumococcus and staph. alb.

Brain, ventricle and pericardium, both staphylococcus.

This was evidently a meningitis of septic origin, part of a general septicemia.

E. E. V., forty-eight, married, tailor. February 17, 1905. An habitually heavy drinker. Two days ago, having been drinking with a friend, left him apparently in good health at 10.55; is said to have immediately after this fallen from a street car and injured his head. Was brought into the Relief Station at 11.10, and was kept over night and discharged as well at 11 o'clock the following morning. On reaching home he was dazed and did not seem to remember anything; held tightly to his head as if in pain. At 10 o'clock the same evening he suddenly became violently delirious.

When brought into the hospital he was breathing rapidly and noisily. He was so violently delirious as to require restraint. There was an ecchymosis about the left eye, and outside the left eye there were a few crusted abrasions. The pupils were equal and reacted well to light. There was no mastoid tenderness, and no bleeding from nose or ears. The tongue was not protruded. There was no rigidity nor apparent tenderness of the neck.

Examination of the chest showed no dulness, but the breathing seemed slightly diminished in the right back. Moist râles were numerous throughout both sides of the chest, more marked in the right back. The noisy respiration rendered the heart sounds inaudible. The liver edge could be felt, the spleen not. Abdomen negative.

Knee jerks equal; no clonus, Kernig's or Babinski phenomena. No evidence of any paralysis; sensation to pin prick normal. White blood corpuscles, 32,600.

The patient continued very delirious, tossing about. On the afternoon of the second day (19th) he was found to have right hemiplegia, Kernig sign and Babinski reflex on the right. He sank during the night, and died at 8.15 the following morning.

No lumbar puncture was done in this case, and in view of the history of traumatism with late-appearing cerebral symptoms and final hemiplegia, he was believed to have probably suffered a hemorrhage from the left middle meningeal artery.

The autopsy was done twenty-three hours post-mortem. It showed considerable arterio-sclerosis of the coronary vessels. The liver was enlarged and quite fatty. The kidneys were granular. The lungs showed a very limited broncho-pneumonia, three areas of about 1.5 cm.

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in diameter, one in the posterior part of the upper, the others in the posterior part of the lower lobe of the right lung.

Section of the head showed a moderate amount of fluid blood beneath the lateral portions of the scalp, particularly on the left. Calvarium thick, moderately dense. Dura mater loose. Convolutions not to be made out through the membranes. Everywhere beneath the dura and still more beneath the pia was an abundant yellow tenacious fibrino-purulent exudate. The distribution of this was quite even, though slightly more over the apex than the base. The ventricles contained a considerable amount of clear fluid with flocculent yellow precipitate. Section of brain showed a firm moist surface; color pinkish white. Puncta cruenta well marked. The exudate extended along the trunk of the cranial nerves for a moderate distance. The Gasserian ganglia were infiltrated with pus. Middle ears and upper nasal passages normal.

The spinal canal contained a considerable amount of fibrino-purulent fluid. Cord firm.

The bacteriological report showed :

Heart blood, sterile.

Spleen, sterile.

Ventricles of brain, staphylococcus.

Meninges, pus injected into rabbit developed pneumococcus.

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III.

A CASE OF DIFFUSE GLIOSIS OF THE CEREBRAL WHITE MATTER IN A CHILD.

By W. N. Bullard, M.D., and E. E. Southard, M.D.
[From the Pathological Laboratory of the Boston City Hospital.]

The case here reported was that of a child which, after a fall on the back of the head, gradually lost power to walk, grew deaf, dumb, blind, and stupid, and died twelve months after the fall. The autopsy showed a peculiar overgrowth of neuroglia, with some destructive properties, confined to the white matter of the posterior parts of the cerebrum, optic thalami, and areas in the white matter of the cerebellum.

I. CLINICAL HISTORY.

Dr. Bullard.

Edward J., six years old, born in Boston, was first seen January 16, 1904.

There was no history of inheritance. His parents were healthy. There were ten children, patient being the eighth. Of these five were dead, four of "stomach trouble" and one of "meningitis."

The patient had always been well up to the time of the present trouble, except for measles when three years old.

Present trouble: Six months ago while playing in the cellar he fell backward down three steps. He was not unconscious, but got up himself and came up stairs crying. He seems to have had some nose-bleed, and possibly bleeding from one ear. The night following he was feverish and restless, but not apparently delirious. The next day he seemed well, and went out to play as usual. He did, however, have nose-bleed whenever his face was washed.

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Since the accident he has been "nervous," and for five months he has had some difficulty in walking, staggering so that he is obliged to put out his hands to steady himself. Has never fallen from this cause. Can use his knife and fork. Mother thinks he is becoming stupid. Frequency of micturition. Is very deaf and has been taken to the Eye and Ear Infirmary, where operation for adenoids was advised.

Physical examination: Head negative. Pupils equal and react to light but poorly. No enlargement of cervical glands. Heart normal. Spine normal. All extremities normal. Triceps reflexes and knee jerks normal; no ankle clonus. Urine 1.022; no albumin.

Patient was not seen again until June 29, 1904. Since March he has been gradually losing sight, hearing, and voice. Is now dumb, and appears to see or hear but little. Is losing the power of walking. He never complains of headache. No vomiting. No convulsions.

Physical examination: Same as before, but now he obeys no directions and does not appear to understand or notice what is going on about him. Cries when examined. Walks with very short steps, swaying from side to side.

Dr. Holmes (Aural Department) reports: No aural signs to account for the deafness, which is apparently of nerve origin.

July 6. Dr. Williams (Eye Department) reports: Some atrophy of each optic nerve, but not enough to account for almost total lack of vision. The latter is presumably of cerebral origin.

July 13. Was admitted to the Hospital Second Surgical Service, Dr. Monks. Temperature normal. Pulse 100–120.

July 18. Operation. Dr. Monks. Trephined about 1½ inch behind and 1 inch above right ear. Dura thickened. No visible cerebral pulsation. Dura opened. Pia slightly thickened, edematous. Several drachms of clear amber-colored fluid drawn from lateral ventricle.

July 20. Died.

II. ANATOMICAL FINDINGS.

Permission was granted to open the cranial cavity. The examination was made fifteen hours after death by Dr. R. L.

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Thompson, whom we wish to thank for his record. The child was 129 cm. long. Development fair. Nutrition good. Pupils equal, 5 mm. wide. Circumference of skull 53 cm. Frontal suture well marked. Surgical opening 1 cm. square in squamous portion of right temporal bone, 5 cm. above and behind external auditory meatus. Dura everywhere adherent to calvarium.

Brain with pia mater weighs 1,445 gms. Pia mater and vessels normal. Convolutions symmetrical. Substance very firm toward occiput. Ventricles contain a normal amount of fluid tinged with blood. Cruor clot, 2 cm. in diameter, in descending horn of right ventricle.

The white matter of the posterior part of the centrum semiovale in both hemispheres is replaced with greyish or straw-colored slightly translucent material of a dense consistence. The lesion is somewhat sharply limited to the white matter; the cortex, of a paler color, sinks below the surface of section. In the right occipital region there is a narrow layer of less dense white matter between cortex and lesion.

The areas of increased density were roughly marked out at autopsy. On the right the lesion involves and in part replaces the white matter of the occipital, parietal, and temporal lobes. The right optic thalamus is somewhat firmer than normal. In the left hemisphere the lesion is still more marked and almost everywhere replaces the white matter of the occipital, parietal and temporal lobes. The left optic thalamus is even firmer than the right. The lesion on the left side stretches at least 1 cm. anterior to a frontal plane taken just in front of optic thalamus. Pieces were removed for fixation in Zenker's fluid, and the rest of the brain was hardened in 10% formaldehyde.

III. MICROSCOPIC FINDINGS.

The sclerosis of the cerebral substance preserves on microscopic examination the same remarkable limitation to the central white matter which was noted in the gross. Except in the optic thalami, the limits of the white matter are nowhere transgressed by the neuroglia overgrowth. The exterior of the lesion in some parts of the occipital region

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follows the contour, and coincides precisely with the inner limits of gray matter. But, in general, the sclerosis corresponds rather to the body of white matter known as the centrum semiovale and may spare the intragyral portion of the white matter.

In spite of the massive character of the lesion, and the compactness of many portions of its structure, the overlying cortex fails to show major lesions, such as secondary changes in nerve cells due to the loss of their processes, or accumulations of phagocytic cells in vessel sheaths, or a reaction on the part of the neuroglia. It is noteworthy that even the upper or subpial layer fails to show a reaction on the part of the neuroglia, despite the frequency of this reaction under numerous conditions. The pia mater and its vessels are likewise free from lesion.

The extent and nature of the damage done by the lesion cannot be exactly determined. The volume of brain tissue remains unaltered, or has been slightly increased by the lesion. There has been at some time considerable destruction or alteration of tissue in the region, as is shown by dense deep masses of pigment-bearing phagocytic cells in the sheaths of the appertaining vessels. The myelin sheaths, and doubtless numerous axis cylinders, have been destroyed in the area of sclerosis. In certain areas which seem paved with neuroglia giant cells separated by a few delicate neuroglia fibrils, it is certain that the original elements must have been destroyed.

In other parts it is by no means certain that all or even the majority of the axis cylinders have been dissolved in the lesion. In a preparation stained with phosphotungstic acid hematein (Mallory) it is possible to follow certain myelinated fibers, in whose myelin sheaths a delicate skeletal substance may stain, till the fibers enter the sclerotic area and lose their myelin. Neither myelin nor the delicate substance within the sheath can be demonstrated in quantity within the sclerotic area.

The anilin blue stain (Mallory) for connective tissue is of service on this point. It is possible, for instance, to demonstrate in this case, by means of the anilin blue stain, the secondary degeneration of fiber bundles about the Gasserian

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ganglion and the secondary degeneration of most of the central bundles of the optic nerve. Unfortunately the application of the anilin blue stain to the brain substance of this case is of less service. For it proves not possible to differentiate convincingly the supposed axis cylinders from long cell processes of some of the large active neuroglia cells which characterize many parts of the sclerotic regions. However, so far as appearance without differential staining can convince, it is possible to say that at least some axis cylinders, minus myelin, penetrate the sclerotic areas. This would align the case with the cases known as multiple sclerosis.

The finer characters of the lesion are of interest, especially as bearing on the differentiation of gliosis from glioma.

The sclerotic tissue varies strikingly in microscopic structure, although the amount of intercellular substance is everywhere above that of the normal cerebral white matter. The variations are chiefly shown in the number and character of the neuroglia cells which produce the fibrils. The transitions in the mass of the lesion are never abrupt and never so well marked as the transition between the sclerotic tissue and the relatively normal cortex. The neuroglia cells vary in number and size in the sclerotic tissue, just as they do in those focal overgrowths of neuroglia tissue which we know as gliomata.

In places (characteristically along the exterior of the sclerotic tissue), the cells are small, placed at fairly regular intervals, and provided with branched cell bodies which somewhat recall the characteristic cell bodies of reacting subpial neuroglia cells.

In other places (characteristically in the interior of the lesion), the cells are larger (often meriting the name giant cell), placed at smaller intervals (sometimes giving a pavemented appearance to the lesion), and provided with numerous overlapping nuclei which are crowded about the periphery of the cell. The centres of these large cells are homogeneous and finely granular and are provided with a varying number of centrosome-like structures.

In a few foci, there is a third type of cell in which activity seems to be spent on expansion of the cell body and the production of numerous heavy, branched, and deeply

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staining processes, which are sometimes frayed at the ends like cut wire rope.

In places there are remarkable clusters and rows of ependymal cysts, lined with perfectly formed ependymal cells, which are provided with basal bodies and attached cilium-like appendages. These cysts are not of diffuse occurrence, but occur particularly in then eighborhood of the posterior horns of the ventricles. Occasionally the cysts are so aligned, between stratified masses of neuroglia coincident in direction with the major axis of the ventricle, that the impression is gained that such accessory cystic spaces are developed along with the ventricle and belong to its ground plan.

Over against these perfectly formed ependymal cysts may be set certain less regular cysts which are perhaps due to the hollowing out of the cytoplasm of some of the giant cells with peripheral nuclei noted above. Such irregular cystic spaces are, however, not common in this tissue.

The gradual variations in cell character above noted, taken together with certain variations in the amount and texture of the intercellular fibrillary substance (often particularly dense about vessels), are not inconsistent with the diagnosis, glioma. There is considerable evidence of tissue destruction throughout the sclerotic tissue in the shape of dense deep masses of pigment-bearing phagocytic cells in the vessel sheaths. The material so laid down is probably derived from the destruction of nerve fiber constituents incident to the lesion, since there is nowhere any sign of necrosis in the sclerotic tissue itself and there is little or no accumulation of phagocytic cells in the overlying cortex or in the pia mater.

IV. SUMMARY.

1. Boy of six and a half years. Measles at three years. One year before death, fell backward down three steps in a cellar, with epistaxis, and possibly bleeding from ear. Afterward "nervous." A month later began to stagger in walking, became gradually deaf and stupid, later blind and dumb. Operation for chronic internal hydrocephalus. Death two days after operation.

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2. The autopsy showed sclerosis of the white matter of the occipital, parietal, and temporal lobes on both sides, with sclerosis of optic thalami and of small, roughly symmetrical areas in the white matter of the cerebellum.

3. The microscopic examination shows a cellular and fibrillary overgrowth of neuroglia, sharply limited to the white matter. The picture gradually varies from that of masses containing giant cells and few fibrils to that of active fibril-producing cell masses or that of stratified areas of dense inactive fibrillar gliosis.

4. The lesion involves the destruction of myelin sheaths and considerable axis-cylinder material. The lesion may be described as a multiform gliosis of the white matter with extensive mildly destructive properties. The nutrition of the areas is maintained. The overgrowth of neuroglia substitutes for, and to some extent destroys, the involved tissues, but fails to invade, in the sense of invasion by glioma. The overlying cortex fails to show important changes. The origin of the condition is unknown.

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IV.

SIXTY CASES OF EXTRA-UTERINE PREGNANCY.

By. F. S. Newell, M.D.

Although the subject of extra-uterine pregnancy has been so thoroughly studied within recent years that, except from the standpoint of etiology, there is little to be added to the knowledge we already possess, it has seemed to the writer that the deductions which may be drawn from the study of any considerable series of cases may be of sufficient interest to warrant the unavoidable repetition of many well-recognized facts. The cases included in this series, sixty in number, have been under treatment in the gynecological wards of the Boston City Hospital during the last five years, and in each case the diagnosis is that of the pathologist, no case being included in the series which did not come to operation, or in which the pathological findings differed from the clinical diagnosis. These patients were operated upon under the same conditions; their histories were taken under the same system; and except for such omissions as were rendered necessary by the patient's condition at the time of admission to the hospital, or to her inability to speak English, the record of each case is as complete as could be obtained. The majority of the patients were drawn from the poorer classes; were of a comparatively low grade of intelligence; and had received little or no medical attention before entering the hospital, so that, of necessity, many points of interest in their previous history have escaped observation entirely, and must be omitted from consideration here.

CLASS OF PATIENTS.

The statement has been commonly made and received without question that the class of patients most subject to

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extra-uterine pregnancy are those who give a history of previous sterility for a number of years, and we should expect to find on investigation that the majority of victims of ectopic gestation are either elderly primiparæ or multiparæ who have become pregnant after the lapse of a considerable interval. In this series only nine patients were pregnant for the first time, and their average age was twenty-nine years, the extremes being twenty and thirty-six, respectively. Of the remaining fifty-one cases, one gave a history of a previous pregnancy sixteen years before, not having been pregnant in the interval. The remaining fifty patients had all been pregnant at a comparatively recent date, one having been delivered of a full term child within four months of the time of operation for the extra-uterine pregnancy. These fifty patients averaged thirty-one years in age, or two years older than the primiparæ, the extremes being twenty and forty-two years respectively. It would seem, therefore, that ectopic gestation is a disease more common in the middle third of the child-bearing period, and in women who have recently been normally pregnant, or rather that the condition may arise in any woman exposed to pregnancy at any time. It must be remembered, however, that our patients were drawn from a class peculiarly subject to pelvic infection, whether gonorrheal or puerperal in origin, and that other predisposing factors may have disturbed the normal ratio.

PREDISPOSING CAUSES.

The predisposing factors in the causation of extra-uterine pregnancy as ordinarily stated are: (1) mechanical obstruction to the entrance of the fertilized ovum into the uterus; (2) inflammatory pelvic conditions; (3) physical and developmental conditions which favor decidua formation in the tubes.

In this series the predisposing conditions were present as follows: Two patients belong in class 1, as they presented obstruction to the descent of the ovum into the uterus in the shape of multiple fibromata of the uterus. No other cases of obstruction were noted. Eighteen gave a definite history of previous pelvic inflammation, while seventeen

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others complained of a chronic vaginal discharge, suggestive of an endometritis at least. In all then, thirty-five patients may be fairly placed in class 2. Of the remaining twenty-three patients, twenty-one denied positively the existence of any pelvic irregularities whatever previous to the inception of the abnormal pregnancy, while from two no history could be obtained.

It would seem evident, therefore, that pelvic infection is the most potent predisposing factor in this series of cases, and that the other causes were relatively infrequent, but the absence of a careful pathological study of the tubes removed at operation leaves the relative frequency of classes 1 and 3 absolutely uncertain.

CLASSIFICATION.

Extra-uterine pregnancy is subdivided into ovarian or tubal pregnancy according to its site. The sixty cases in this series were all tubal, and in no case was the interstitial portion of the tube involved. The right tube was involved in thirty cases, the left in twenty-four, and in six (operation vaginal section) the pelvic relations were not clearly made out. The tubal pregnancy was removed unruptured in fourteen cases. Peritoneal rupture had occurred in twenty-two cases, tubal abortion in twenty-two cases, and broad ligament rupture is reported twice, but since in both instances the pelvic hematocele was incised from the vagina the diagnosis is open to question, as the definite pelvic relations were not absolutely made out.

These figures do not agree with the ordinary statistics that tubal abortion occurs in 75 per cent. of the cases of tubal pregnancy, but it must be remembered that the hematocele due to tubal abortion absorbs spontaneously in a large proportion of the cases, and that only such cases come to operation as present symptoms which demand interference.

SYMPTOMS.

The diagnosis of extra-uterine pregnancy depends entirely upon the observation of certain symptoms, which are not, however, by any means pathognomonic of the condition.

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The principal symptoms are: (1) abnormality of menstruation; (2) pelvic pain, usually referred to one ovarian region; (3) the presence of a mass separable from the uterus; and (4) signs of internal hemorrhage, varying from increasing pallor and fainting spells up to complete collapse, according to the amount of blood lost and the rapidity of the hemorrhage.

ABNORMALITIES OF MENSTRUATION.

Of the fifty-eight patients whose history was obtainable fifty gave a definite history of abnormal menstruation. Of these twenty had supposed themselves pregnant on account of the omission of one or more periods, followed in some cases by the symptoms of an early abortion, for which one patient was curetted before her entrance to the hospital. Thirty patients gave a history of irregular and excessive flowing, grading from a prolonged flow usually beginning coincidently with an expected period up to a condition resembling the hemorrhage incident to an incomplete abortion. Eight patients had no menstrual irregularities.

PAIN.

Abdominal pain of greater or less degree was complained of by fifty-seven patients. The pain usually occurred in paroxysms referred to one ovarian region at intervals of a few hours, or in some cases days, with comparative freedom in the intervals. In some cases, however, pain was constant, though with sharp exacerbations, and was at times not localized. It has proved impossible to classify the cases according to the pain described, since the personal equation enters into the description of pain to such an extent that nothing definite as to the character of the pain in the different conditions could be made out. As a rule, however, the cases which had undergone peritoneal rupture complained of more severe pain than either of the other classes of cases.

MASS.

In forty-eight cases the presence of a pelvic mass of greater or less size was demonstrated before operation. In

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twelve cases the patient's condition at the time of entrance was such that the diagnosis was evident, and unnecessary interference was considered inadvisable.

SIGNS OF HEMORRHAGE.

Twelve patients entered the hospital with marked signs of internal hemorrhage and shock. Seven others gave a history of collapse at some time previous to entrance, and thirteen had had fainting spells coincident with the attacks of pain.

OTHER SYMPTOMS.

Temperature. — The temperature at the time of operation furnished practically no guide to the condition present except in the patients who were in collapse with a subnormal temperature. In the others it varied from normal to 105°. It was 100° or more in twenty-two cases, and less than 100° in the remaining thirty-eight.

Leucocytosis. — The leucocyte count also proved to be of little value in aiding diagnosis, since the peritoneal reaction to the presence of blood, even in cases where there was no evidence of infection, as shown by cultures taken at operation, apparently produced a condition similar to that when pus was present. As a rule there was a leucocytosis of from 12,000 to 20,000, and in one or two cases it was as high as 30,000.

DIAGNOSIS.

In the absence of pathognomonic symptoms the diagnosis of extra-uterine pregnancy is somewhat uncertain. In the cases which present the more severe signs of a recent rupture there is little or no question, and in certain of the unruptured cases it is fairly simple, but in the patients in whom the slow accumulation of blood clot, as occurs in many cases of tubal abortion, has resulted in the formation of a large fluctuating pelvic mass, with signs of infection or of peritoneal reaction, exploration furnishes the only sure means of diagnosis.

In eighteen out of the sixty cases in our series, the pelvic trouble was apparently inflammatory in origin and was wrongly diagnosed. In forty-one the diagnosis of probable extra-uterine pregnancy was made, and in one case, compli-

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cated by multiple fibromata of the uterus, the ectopic gestation was first suspected when the abdomen was opened for the performance of an hysterectomy. On the other hand, several cases of acute salpingitis have been subjected to an immediate operation for symptoms which would justify a positive diagnosis of extra-uterine pregnancy. In other words, a definite diagnosis would seem impossible in many cases.

OPERATION.

In the sixty cases of this series forty-three were operated on by the abdominal and fourteen by the vaginal route. A combined operation was done in three cases. Of the forty-three laparotomies thirty-five recovered, of whom thirty-three were discharged well and two relieved. Eight patients died after laparotomy. Gauze drainage was employed in sixteen cases either for free oozing from torn adhesions or in cases whose elevated temperature and other symptoms suggested the possibility that the evacuated blood clot had become infected. In twenty-seven cases the abdomen was flushed out and closed without drainage. The length of stay in the hospital after operation averaged four weeks.

Of the eight patients who died, two died from shock and hemorrhage; four of general peritonitis, three of whom were drained at the time of operation, two for suspected infection and one for oozing; one died of pulmonary embolus on being etherized to reopen the abdominal wound for peritoneal symptoms, and one of cerebral thrombosis six days after operation. In one patient the wound was reopened and drained on the second day for beginning peritonitis, with recovery. One patient developed a phlebitis of the leg after operation, but recovered. Of the two patients discharged relieved one had a drainage sinus still open, which eventually closed under treatment, and the other had considerable pelvic exudate still remaining.

Of the fourteen patients on whom vaginal section was performed five were discharged well, eight relieved, and one died. The convalescence averaged six weeks, the patients for the most part running a more or less marked septic tem-

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perature, and the pelvic condition at discharge being unsatisfactory, necessitating a subsequent operation for removal of the diseased tube. In two cases the tube was removed per vaginam. In the first case it was unruptured and easily removed, but the patient subsequently developed general peritonitis and died in spite of the performance of a laparotomy. In the other case the tube was found ruptured and bleeding. Both ends were clamped and the tube removed, the clamps being left in situ for forty-eight hours. Two weeks later peritoneal symptoms developed and a laparotomy was performed, a fecal fistula being found. The patient eventually recovered after a prolonged illness.

In two patients the vaginal sinus had to be reopened, on account of backing up of septic material, but both recovered. The convalescence in these cases averaged about seven weeks.

In three patients a combined abdominal and vaginal operation was performed with satisfactory results, the abdomen being closed and vaginal drainage employed. Two patients were discharged well, and one relieved, the vaginal sinus being still open at the time of discharge. The convalescence averaged four and one-half weeks. In these cases the vaginal operation was first performed, the diagnosis of pelvic abscess having been made, but was immediately followed by a laparotomy, with gratifying results.

CHOICE OF OPERATION.

Our experience in these cases leads to the conclusion that extra-uterine pregnancy is a condition which can best be reached by an abdominal operation. A laparotomy allows of the thorough removal of the offending tube and the performance of a proper peritoneal toilet. Drainage can be used or not, in accordance with the conditions found, but there can be no question but what if infection of the blood clot is suspected it is safer to drain for at least forty-eight hours. In cases who are first seen in extremis from shock and hemorrhage, a reasonable interval before operation should be granted to allow for the reaction which usually follows the cessation of hemorrhage. If, on the other hand, no improve-

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Case No.	ENCE.	Condition at Discharge.	Result.	Operator.	Cause of Death.

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ment occurs within a few hours, or if the patient's condition continues to fail, it may be taken for granted that hemorrhage is still going on, and immediate operation, followed by heroic stimulation, offers the best chance.

Vaginal section, from our experience, is unsatisfactory, owing to the impossibility of performing a proper peritoneal toilet at the time of operation, and the impossibility of removing a densely adherent tube, or of being sure that hemorrhage has been controlled. In addition the end results of vaginal section for extra-uterine pregnacy are such as to render a subsequent laparotomy necessary to restore health in the majority of cases.

If, on the performance of vaginal section for a diagnosis of pelvic abscess, an extra-uterine pregnancy is found, I strongly advocate an immediate laparotomy if the patient's condition warrants it, and the employment of vaginal drainage.

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V.

OXYURIS VERMICULARIS IN THE VERMIFORM APPENDIX.

SAMUEL T. ORTON, M.D.,
Acting Second Assistant in Pathology.
(From the Pathological Laboratory of the Boston City Hospital.)

White male child, nine years old, admitted to the hospital with a history of sharp pain in the right lower quadrant of the abdomen for two days, with some local tenderness and rigidity and moderate fever. At operation, an appendix was removed which was somewhat thickened and slightly reddened, otherwise apparently normal.

Later, on longitudinal section, the lumen was found to contain seventy-four adult female oxyurides and a number of males and a small quantity of sero-purulent fluid.

Recovery from ether and healing of the wound were satisfactory.

On the day following operation, the patient's bowels were opened with a mild laxative, but examination of the stool failed to reveal any oxyurides or their ova. Free catharsis was not established on account of the subsequent development of a mild atypical attack of typhoid fever, from which the patient made a complete recovery in about six weeks. At no time were any ova or adult worms found in the stools.

Microscopic examination of the appendix shows chronic inflammatory changes. The mucous membrane is thickened, and the glandular epithelial cells are swollen with mucus. The submucosa and muscle layers are infiltrated with lymphoid and plasma cells, but there is no evidence of ulceration, or of acute inflammatory reaction.

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Kelly and Hurdon quote seven cases of oxyurides in the appendix, among others of the helminthes, and state that an invasion of oxyuris is more apt to cause chronic inflammatory changes, while the larger worms, such as ascaris lumbricoides, are more often associated with gangrenous appendicitis.

Oxyuris vermicularis is said to pass its life in the small intestine and cæcum up to the period of sexual maturity, when the females descend to the rectum, or even out on to the perineum, to deposit their ova, thereby causing the pruritus, so constantly associated with their presence.

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VI.

MULTIPLE PRIMARY HETEROGENEOUS TUMORS.

By Paul A. Lewis, M.D.
Second Assistant in Pathology.
[From the Pathological Laboratory of the Boston City Hospital.]

CASE REPORT.

Many cases showing a multiplicity of tumor formation have been reported. In most of them the growths have been similar in structure and have taken origin from one organ or one system. Thus multiple fibromata of the skin or peripheral nervous system are not uncommon. Cases in which the several tumors differ in origin and structure are less frequent. Because of the number and variety of the new growths which it presents, the post-mortem description of a case showing tumors in the skin, liver, adrenal, kidney, ovary, broad ligament and uterus is of interest.

Autopsy by Dr. Duval. (A-04.41.) In the body of a poorly developed white woman who died of broncho-pneumonia at the age of seventy these noteworthy features were present.

Skin. — On the skin over the chest there are a number of moles. .5-1 cm. in diameter.

Liver. — On the anterior surface of the right lobe directly over the gall bladder is a sharply defined, bluish black sunken area, measuring 1.5 by 3 cm. On section this area is dark red, feels spongy, and is of greater transverse diameter than on the surface, so that it has the shape of a truncated cone. Another similar but smaller area is seen within the central part of the anterior lobe closely approximated to a central vein.

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In the upper anterior part of the right lobe near the surface is found a slightly elevated "muscle-like" area 1 cm. in diameter, differentiated by its homogeneous pale red color from the mottled, darker red, liver tissue. Near the suspensory ligament in the right lobe are two or three grayish white areas .5 cm. in diameter, standing out sharply from the surrounding liver substance. Still another nodule in the right lobe is 7 mm. in diameter, opaque, white, soft and sharply defined.

Kidneys. — Gross appearance normal.

Adrenals. — The left adrenal is firm, irregularly circular in contour and much enlarged. It contains a rather soft, oval, somewhat lobulated tumor. Opaque and yellow in color, measures 2 by 1.5 by 1.5 cm. In color and structure it resembles the adrenal cortex. The right adrenal is normal.

Genital Organs. — There is a small interstitial leiomyona in the uterus near the entrance of the left tube. Springing from the right corner and spreading out in the shape of a fan is a polypoid growth hanging free in the uterine cavity.

The left ovary is replaced by a dumb-bell shaped, very dense fibroid tumor 4 by 5.5 cm. The mass lies free in Douglas' cul de sac. On the anterior surface of the left broad ligament, covered by peritoneum is a dark mass, 1.5 by 2 cm., somewhat irregular to palpation. On section it is lobulated, firm, and bluish gray in color.

MICROSCOPIC EXAMINATION.

Liver. — Microscopic section of the blue black, spongy mass shows it to be a definite tumor made up of blood-filled sinuses with connective tissue walls of variable thickness. The walls are always thin in proportion to the width of the sinuses, and in some places consist of little more than a double row of endothelial cells. The sinuses are everywhere lined with endothelial cells, flat for the most part, but in places very high. In one instance the place of a large sinus is taken by a mass of loose connective tissue and newly formed capillaries. The whole is encapsulated with a comparatively heavy fibrous sheath, which in most places adjoins normal liver tissue without infiltration.

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Here and there, however, the sheath encloses small islands of liver cells suggesting an extreme grade of atrophic cirrhosis.

The light red muscle-like nodules are marked off from the normal liver tissue either by a light band of connective tissue or by a few rows of compressed liver cells. Within these boundaries the structures have the general characteristics of liver tissue. But the cells as a rule are larger than those of the normal liver. They stain less regularly and show more vacuolation. Instead of the regular arrangement into cords, the cells are often found in considerable masses. Regularly formed lobules are absent. Between the cells there is more connective tissue than in a normal liver. The capillaries run irregularly. No large bile ducts can be found in these areas. On the other hand, the phosphotungstic acid-hematein stain demonstrates the bile capillaries throughout and proves that the tumor is made up of liver cells.

Adrenal. — The left adrenal itself seems normal. Outside the capsule is a tumor consisting of large, clear cells arranged in cords and alveoli. Between the groups of cells is a very light supporting net-work of connective tissue. Individual cells when they are not too closely crowded together are irregularly rectangular in shape. Their cytoplasm is granular. In places it stains deeply; in other places very faintly, and here the cells show many vacuoles. The nuclei are of the large, clear vesicular type. They have large nucleoli staining deeply, either blue or red, with the eosin-methylene blue stain. Ordinarily there is one nucleus to a cell, but here and there two or more are seen. Often the nucleus shows signs of direct division. Some are shrunken and pyknotic. Others are broken into small fragments scattered through the cytoplasm. No mitotic figures are found.

Light strands of loose connective tissue containing capillaries run between groups of cells. In places this gathers into heavier bands which give a distinct lobulation to the growth. In general the arrangement and character of the cells is that of an irregular and unrestrained growth of the adrenal cortex. Distinct areas representing the zona glomerulosa, and other areas arranged as is the zona fasiculata of the cortex can be made out. No medullary tissue can be recognized.

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Kidney.— The blood vessels and capillaries are much congested, especially in the boundary zone. In one small area in this zone the vessels are dilated into thin wall sinuses. This area encloses a few tubules, and is not at all walled off from the surrounding kidney substance. The structure is similar to that of the vascular tumor of the liver already described.

Skin.— The moles over the skin of the chest have the following microscopic structure. From a small section of the corium there springs a large thickened mass of subepidermal connective tissue. This spreads out from the base in the shape of a fan. The ribs of the fan vary in length so that the surface of the growth is thrown into papillæ. The epidermis is thin, but everywhere present. It is covered by dried secretion. The cells in the lower layer of the epidermis in some places show much greenish brown pigment. In the connective tissue under the epidermis are numbers of round cells with clear vesicular nuclei.

They have a small amount of cytoplasm which tends to project from the cells as protoplasmic processes. The cells lie singly or grouped in small alveoli. Many of them show the same pigmentation as that seen in the cells of the epidermis.

Leiomyoma.— The tumor of the broad ligament is found definitely encapsulated by a fibrous sheath. It is made up of large spindle-shaped cells supported on a scanty connective tissue network. The cytoplasm of the spindle cells stains very irregularly but deeply with eosin methylene blue. The nuclei fill the whole of the central part of the cell. They are long and have an oval or rectangular outline. Their chromatin network is light. The nucleolus is prominent. Some of the nuclei are fragmented, some pyknotic. Several mitotic figures are to be found. The blood vessels in places have very definite walls. In other places a wall is hard to make out. The morphology of the cells and their characteristic staining with the anilin blue connective tissue stain shows definitely that the tumor is a leiomyoma.

Ovary.— Rather sharply marked off from the ovary is a tumor made up of irregularly interlacing bundles of wavy

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spindle-shaped cells. The nuclei are small and spindle-shaped. Mallory's connective tissue stain demonstrates much intercellular fibrillar substance. There is no evidence of the presence of smooth muscle cells. The fibrous tissue closely resembles that normally present in the cortex of the ovary.

Uterus. — The muscular tissue of the uterine wall is largely replaced by connective tissue.

The polypoid tumor is found on section to be made up of a number of cysts of variable size. Each one is filled with a granular precipitate. They are lined with a single row of cylinder-celled epithelium. The stroma is slight, being made up of loose connective tissue, and contains blood vessels with definite walls. Within the pedicle the cysts extend to the level of the uterine mucosa. The interstitial tumor is a typical benign leiomyoma.

To sum up the findings in this case we have:

1. Angioma Cavernosum of liver.
2. Angioma Cavernosum of kidney.
3. Adenomata of liver.
4. Adenoma of adrenal.
5. Adenomatous polyp of uterus.
6. Interstitial leiomyoma of uterus.
7. Malignant leiomyoma of broad ligament.
8. Fibroma of ovary.
9. Pigmented naevi.

So long as no two authorities agree on the proper definition of a tumor, it is not to be expected that an actual count of the number of tumors present can prove satisfactory. Suffice to say, that we have a total of eight distinct varieties of new growth or abnormality in development in the skin and internal organs. Of these the ovarian fibroma, the interstitial leiomyoma, the adenoma of the adrenal, and the leiomyoma of the broad ligament are tumors under any good definition. That the latter is malignant is indicated by the mitotic figures, which point to a rapid growth.

As the benign growths may at any time give rise to malignant tumors, this case adds to our evidence that primary malignant tumors may at times be multiple.

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VII.

A CASE OF DIABETIC COMA WITH RECOVERY UNDER ALKALINE TREATMENT.

By George G. Sears, M.D.

John N., thirteen years old, was transferred to the First Medical Service on February 25, 1905, from the Parental School, where he had been under observation during the previous four months. He had suffered from excessive hunger and thirst and had passed large quantities of urine. His strength had steadily failed, and his weight had fallen from seventy-five to fifty-nine pounds. During the past three days he had complained of epigastric pain and had grown weaker and duller.

Examination showed an undersized, emaciated boy in a semi-comatose condition, from which he could be aroused with difficulty. His breath smelt so strongly of acetone that the odor could be detected outside the door of his room. The skin was dry, harsh and everywhere covered with fine bran-like scales. A purpuric eruption was present, especially over the abdomen, which was very prominent and marbled with large veins. The liver and spleen were both felt below the costal margin. The extremities were cold and somewhat cyanotic. The pulse was rapid and barely perceptible at the wrist. Respirations 30, deep and full. Temperature 99°. Pupils dilated, but reacting to light. Knee jerks absent. Urine pale, acid, sp. gr. 1.033, albumen, a trace. Sugar 5.3%. Acetone and diacetic acid present. The sediment contained occasional hyaline and fine granular casts. Amount in the first twenty-four hours after admission, 156 ounces.

Immediately after entrance, under the direction of Dr. W. L. Barnes, the house physician, he was given stimulants, and

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eight ounces of sterile salt solution, containing bicarbonate of soda almost to the point of saturation, were injected under the skin of each breast. After a cleansing enema an attempt was made to introduce more bicarbonate of soda by the rectum, but the attempt was unsuccessful. A solution of the same drug, in the proportion of a heaping teaspoonful to the tumbler, was ordered to be given by the mouth to the limit of his capacity. No record of the amount was kept, but, as he was very thirsty, large quantities were taken. His stupor rapidly decreased, but he remained drowsy for several days. Convalescence was interrupted on March 12 by the onset of severe general convulsions, probably of uraemic origin, as the amount of urine which had previously been large, eight to eleven pints in twenty-four hours, suddenly diminished to about three, and hyaline and fine granular casts appeared in enormous numbers in the sediment. No blood was found and the albumen was not markedly increased.

In spite of the large doses of alkali given, the urine remained persistently acid throughout his stay in the hospital. Sugar varied between 1 and nearly 3 per cent. under a diet which contained a little bread and considerable quantities of milk. Acetone was more frequently present in the urine than absent, but its odor persisted in his breath only a few days after entrance.

The only other complication of note was the occurrence of suppuration at the site of the hypodermic injections; on the morning after they were given there was marked swelling, redness, and tenderness over each breast. Palpation gave the sensation of an air cushion, and crepitation was present. The injections were given by means of a glass flask used as a fountain syringe, and no leak in the apparatus was apparent. Incision was later required, and the abscesses were long in healing.

He weighed seventy-five pounds in May, and when last seen in July was in fair condition.

A search through the literature has revealed but few instances of recovery from diabetic coma as a result of any form of treatment. Cases of partial success have been reported by Fagge[1], Taylor[2], Taylor and Goodhart[3], Dickin-

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son[4], Hesse[5], Wolpe[6], Freiberger[7], Germar[8], Troje[9], Magnus-Levy, Chadbourne[10], Lépine[11], Besson[12], Young[13], Burghart[14], Rosenstein[15], and others. Of these Fagge's is the most interesting, as it initiated a new form of treatment and was the most successful. Acting on the assumption that the increased viscidity of the blood was the exciting cause, he injected a solution of salt and phosphate of soda. The patient regained consciousness, but relapsed and died comatose three days later. Fagge attributed the fatal ending, probably erroneously, to an overdose of codeia. Stimulated by this success and under the influence of the same theory, enormous quantities of fluid have been thrown into the blood current; in Dickinson's case, for example, 106 ounces were injected at one time and 350 at another, two days later. Some improvement was noticed at first, but death was postponed but a short time, if at all, and at the autopsy the tissues were found flooded with fluid.

The results in all were transitory; the progress toward death in coma was interrupted by a return to consciousness, more or less complete, which lasted at the longest but a few days. The improvement does not seem to have been dependent on the form of medication introduced, but was the consequence of the stimulating effect of intravenous injections, very probably aided by the dilution of the poisons circulating in the blood.

In the following cases, of which a brief abstract is given, as they are not all free from possible error as to the diagnosis, complete recovery from coma was obtained:

Case No. 1. — (Oliver[16].) A man thirty years old, who had been a sufferer from diabetes for fully eight months, and under hospital treatment for about three weeks, returned a few hours after discharge in a state of coma, with a pulse of forty-five. No mention is made of the character of his respiration. His urine was not examined until the following day, when it contained sugar, but no acetone nor albumen. The amount was twenty-one ounces, instead of 140 to 200 ounces, when first admitted. After transfusion of a pint of salt solution he revived, and was doing well at the end of twenty-eight days. A local bronzing of the skin, previously noticed, became more marked after the attack. Six days later he complained of numbness in the right hand, with slight anæsthesia. Distinct paresis of the extensor muscles with wrist drop was present.

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Case No. 2. — (Roget and Balvay[17].) An hysterical male, twenty years old, of nervous antecedents and with a previous history of alcohol, syphilis, and an injury to his head, came under treatment for various symptoms referable to the nervous system. No sugar was found till July 4, eleven days after admission. On August 1 symptoms of coma came on, preceded by convulsive movements chiefly of the left side. The odor of acetone was noticed in the breath. The urine showed 8.33 grammes of sugar, a trace of acetone and 2.3 grammes of oxybutyric acid per litre. On the afternoon of August 4 a litre of water containing 7 grammes of chloride of soda was injected intravenously. At midnight there was slight improvement, but the next morning coma was complete and was attended by epileptiform convulsions. In the afternoon two litres of the same solution were given under the skin, and this was repeated several times during the next three days, and copious draughts of an alkaline water were given. On August 12 he had complete possession of his faculties, and sugar, acetone, diacetic and oxybutyric acids had disappeared from the urine. Death occurred four months later from purulent pleurisy.

Case No 3. — (Ravaut[18].) A woman, twenty-nine years old, with tumor of the pineal gland, akromegaly and diabetes, was several times rescued from threatened coma by the administration of soda bicarbonate (30 to 40 grammes per diem) and subcutaneous injections of a 1 per cent. solution of the same drug.

Case No. 4. — (Elliott[19].) A man, seventy-six years old, suffering from diabetes and chronic nephritis, began on March 26, 1902, to show signs of diabetic toxæmia, manifested by somnolence, constipation and the acetone odor, but only a trace of diacetic acid was present in the urine. Coma deepened until there were only two or three lucid intervals in the twenty-four hours. The urine then contained urea, 301 grains, sugar, 2 per cent., albumen, 1 per cent. by bulk, acetone and diacetic acid. Amount, 70 ounces. Under cathartics, colonic irrigations with normal salt solution and "large quantities" of soda bicarbonate by the mouth and rectum, he gradually improved, and on April 6 was able to sit up and was free from his acetonuria. He died twelve days later from uræmia with slight convulsions.

Case No. 5. — (Stern[20].) A woman, aged sixty-eight, with arteriosclerosis, in partial coma. The urine contained sugar, 3.22 per cent., acetone, diacetic and oxybutyric acids. Bicarbonate of soda, 5 grammes, was given every hour by mouth, and calcium carbonate, 2 grammes, in a litre of water, every four hours by rectum. The symptoms cleared up on the third day, and acetone and diacetic acid disappeared from the urine. Two months later she had a similar attack which yielded to similar treatment, but death occurred in collapse a few days later.

Case No. 6. — (Stern[20].) A woman, sixty years of age, apathetic and somnolent, with acetone odor to the breath. Sugar, 4 per cent., acetone, diacetic and oxybutyric acids were found in the urine. Large doses of calcic carbonate were given by mouth and rectum, and on the fourth day the somnolent condition was almost completely gone. She remained well for two weeks, though the diacetic acid persisted. The symptoms then returned, but subsided under similar treatment. Six

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weeks later a more severe attack came on, in which the bicarbonate of soda was given in addition to the lime salt. The patient again rallied, but died from exhaustion within a few days.

Case No. 7. — (Reynolds[21].) A man "with the usual signs of rapidly approaching coma." His breath and urine smelt strongly of acetone. The latter reacted to the perchloride of iron test, contained considerable albumen, and less sugar than usual. Influenced by Fagge's example, an effort was made to dilute the blood. As he was able to swallow, an aperient was given, and he was ordered to take a gallon of fluid during the night, and sixty grains of citrate of potash every hour. He was slightly better the next morning, and the treatment was continued for another twelve hours, the citrate of potash being diminished. In three days all symptoms of coma had disappeared, and he was subsequently discharged.

Case No. 8. — (Reynolds[21].) A man in a "dangerous condition" with "marked albuminuria, slight drowsiness and breathlessness, but no characteristic pain in the stomach." He was ordered castor oil, large quantities of fluid, and from thirty to sixty grains of citrate of potash every hour. In two days the acetone odor had disappeared, and the ferric chloride test was negative. Ten days later albumen was no longer present. He was in fair condition two months later.

Case No. 9. — (Grube[22].) A man, forty-nine years old, diabetic for two years, developed on June 25, 1903, well-marked coma with acetone, diacetic and oxybutyric acids in the urine. He responded to loud calls by slowly opening his eyes. Being able to swallow when carefully fed, he was given 5 grammes of bicarbonate of soda hourly for forty-eight hours. His food was cut down to two litres of milk a day. During the first night he had two well-marked asthmatic attacks. The following morning the breathing was normal, and at midnight he recovered full consciousness, and the odor of acetone, which had been very marked, was scarcely perceptible. The urine was neutral on the 27th of June, and on the 28th was alkaline. He was able to return to England in the middle of July.

Case No. 10. — (Chauffard[23].) A man, diabetic, who had begun to complain of headache, dizziness, melancholia and inability to think. The urine had diminished in amount and acetone was present in large quantities. Coma seemed imminent. Under a milk diet and 20 grammes of bicarbonate of soda daily, the symptoms passed off in less than forty-eight hours, but the urine showed no diminution in acidity until 300 grammes of the drug had been taken.

Case No. 11. — (Lépine[24].) A man, thirty-seven years old, who had lost ground in spite of treatment covering several months and including the daily administration of more than 20 grammes of bicarbonate of soda. His appetite and strength diminished, and finally a marked increase in the respiratory movements was noticed. This was interpreted as a sign of approaching coma, and two litres of salt solution containing 10 grammes of bicarbonate of soda to the litre were injected intravenously. As a result the excretion of acetone and diacetic acid was at least tripled in amount. The patient regained his appetite and strength.

Case No. 12. — (Minkowski[25].) An eleven-years-old girl, who for a year and a half had suffered from severe diabetes, and was passing four or

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five litres of urine containing 7-8 per cent. sugar, three-fourths grammes NH_3 per day and much oxybutyric acid. The ferric chloride reaction was marked. Following an abrupt change to a strictly nitrogenous diet, coma developed. After ineffectual attempts to inject bicarbonate of soda subcutaneously, it was given by the mouth, and up to the following morning she took 100 grammes. The sensorium was then clear, but her breathing was deeper than normal and the urine was still acid. The soda was continued with satisfactory results. She remained under observation for two months owing to the formation of an abscess at the site of the attempted injection.

Cases Nos. 13 and 14. — (Naunyn [26]) records the case of an eight-years-old boy, in whom threatened coma was three times averted by bicarbonate of soda, given by mouth and rectum. The patient died in the fourth attack, the production of acid having become so great that it was impossible to neutralize it. Magnus-Levy speaks of another case of Naunyn's in a girl twelve years old as a remarkable instance of recovery under the use of alkalies, but gives no details.

Case No. 15. — (Magnus-Levy [27].) A boy, thirteen years old, with severe diabetes and nephritis. His urine contained large amounts of acetone, diacetic and oxybutyric acids. He survived two attacks of coma within a month, under large doses of bicarbonate of soda, as high as 210 grammes a day. A week after the second attack threatening symptoms were again averted by the same means.

Case No. 16. — (Magnus-Levy [28].) A girl of thirteen, with severe diabetes and marked acidosis, for which she was taking daily doses of 9-18 grammes of bicarbonate of soda. Nevertheless, as a result of a feverish rhinitis and angina, coma of the typical dyspnoeic form developed. For two days after the beginning of the dangerous symptoms the diet was limited to milk, and bicarbonate of soda was given. She retained on the first day 2.4 litres of the former and 109 grammes of the latter, and on the next 4.5 litres and 102 (?) grammes respectively. Improvement was rapid, and within forty-eight hours the coma had fully disappeared and the urine had become alkaline. She remained under observation for two months, during which time the urine was acid in spite of continued alkaline treatment.

In addition to these, Zinn ([29]) briefly mentions the case of a female patient who received on one occasion an injection of eighteen grammes of bicarbonate of soda in 5 per cent. solution, and on another seventeen grammes. In both instances she came rapidly out of her coma.

These cases include all grades of coma, from a slight drowsiness or depression to complete loss of consciousness, and have been presented at their face value on the authority of their reporters. The diagnosis, however, does not appear to have been established in a number of instances beyond a reasonable doubt. In some the histories do not harmonize

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with the usual symptoms of true diabetic coma, while in others, especially among the older patients, other causes of cerebral disturbances, arterio-sclerosis, apoplexy, tumor, syphilis, hysteria or uræmia could not always be eliminated. The diagnosis of threatened coma is not always easy, and it is not impossible that in some it was assumed on insufficient evidence. Disturbances of digestion and general depression may precede its onset, but it is not a necessary sequence, and recovery from such conditions has not infrequently occurred spontaneously. Few as the recorded cases of recovery from diabetic coma are, they are enough to show that we are no longer helpless in its presence. The recognition of the part which acid intoxication plays in the natural history of the disease has made it possible frequently to postpone the onset of coma for indefinite periods, occasionally to arrest its progress at its beginning, and rarely to rescue a patient from its fully-developed stage. But as alkalies are purely symptomatic remedies which combat effects and not causes, they can only be of use before changes in the tissues have occurred, which prevent their recovering their normal functions, or, to quote Naunyn, before the flow from the acid springs within the organs is so copious that the alkaline stream of blood is powerless to make headway against it.

Acting as a chemical antidote it is necessary that the dose of alkali should be sufficient to neutralize the offending acids, and the greater success which has been obtained in children is probably largely due to the greater relative amount which can be given. Such cases as Lépine's, however, in which the diagnosis is evident and in which but 20 grammes of bicarbonate were given, show that when administered early enough quantities which must be entirely inadequate for complete neutralization may be efficient by neutralizing the excess of acid to allow the organism to resume once more its oxidizing processes.

While the subcutaneous tissue, the veins, the rectum and the stomach have all been used with success either alone or in various combinations, these cases show that the method of administration is much less important than the amount. Hypodermic injections have the objection that they are

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usually followed by suppuration and necrosis. The intravenous route is free from this danger and its stimulant effect may be of great advantage. Large doses by the mouth may produce vomiting and diarrhœa, but it is noteworthy that some of the most satisfactory cases were treated in this way alone. While the measure of success may be sought in the ability to make the urine alkaline, coma has been checked in spite of a continued acid reaction.

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VIII.

RUPTURE OF THE INTESTINE.

By F. B. Lund, M.D.

Cases of rupture of the intestine from blows upon the abdomen are of natural interest to the surgeon, for the reason that not infrequently the intestines may be ruptured and the injury fatal unless immediate operation is done. The first operation for ruptured intestine was performed by Bouilly in 1883, the first successful operation by Moty in 1889.

The abdominal viscera, although they have no bony wall to protect them in front, are protected from injury by their position, and by the immediate, involuntary contraction of the abdominal muscles which takes place the moment a coming blow is seen or expected. In injuries sustained through contests of physical strength blows upon the abdomen are comparatively rare on account of the protected position in which the abdomen is held.

I think that there can be no question, from a study of these cases, that, where rupture of the intestine takes place, the intestine is generally caught between the body which causes the blow upon the abdomen and one of the bony structures which forms its posterior walls. The abdomen must be, as it were, taken unawares, delivered a rapid, violent blow before the muscles have time to contract, and the intestine compressed between the impinging body in front and the vertebræ or pelvic bones behind. There is no question but that the actual pinching of the intestine between the body which causes the blow and the bone may rupture it. There is also the probability that the catching of a distended coil of the intestine between the impinging body on the outside and the vertebræ or pelvic bones behind may suddenly cause the

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gas in that coil to burst out through the intestinal wall, thus rupturing the intestines in another way.

The evidence of this is seen in the fact that we find lacerations of the peritoneum without injury to the muscular and mucous coats which have the appearance of having been caused by overstretching, and in actual ruptures of the intestines the peritoneal tears sometimes extend to either side some distance beyond the actual orifice.

In order to allow these ruptures by bursting to take place, both arms of a loop must be caught and compressed, otherwise the gas will not be pent in. Such conditions are obviously present in case of a hernia, the loops being grasped in the ring so that the gas cannot escape, and the intestine, having no muscular covering, simply the skin and the fascia of the hernia, being exposed to direct compression between the injuring body on the outside and the pelvic bones or the aponeurosis, from which it cannot slip away, behind. It is obvious that intestine shut up in a hernia may be ruptured by a slighter blow than that free in the abdominal cavity.

Ruptures due to catching of the intestine between the pelvis or vertebral column and the impinging object vary in size, and may be even extensive tears of the gut (case 6). Those due to bursting of the gas through a loop present a small, round perforation (case 12), with often a more extensive peritoneal tear. It is remarkable to what an extent, even when the tear is a large one, the everted, swollen mucous membrane will plug the opening and prevent the extravasation of feces. This is also prevented by the contractions of the circular fibres immediately above and below the injury. In only a few of the cases here reported were solid intestinal contents found in the abdomen. Commonly only a little fluid, necessarily contaminated with the bacterial flora of the intestine, escapes, and starts up a local peritonitis, evidenced by pain, tenderness and muscular spasm. The development of the general peritonitis and septicæmia may be delayed for hours, but it is none the less inevitable unless the opening is sutured and the peritoneum cleansed. Ruptures from catching the intestine against the bony wall

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may be in any relation to the mesenteric border, and may be accompanied by rupture of the mesentery. Those due to bursting are usually opposite the mesentery.

The writer has studied the history of nineteen cases of rupture of the intestine which have been treated in this hospital, and the etiology is to him extremely interesting. These nineteen cases are due to causes which fall into four classes. The first class, and the one which first directed the writer's attention to the cases, comprises those ruptures of the intestines which are caused by blows upon the abdomen by a piece of board thrown by a circular saw: Cases 1, 6, 8 and 18.

Here the injured patient is feeding a board to the rapidly revolving saw, standing, presumably, with his abdomen relaxed, against the end of the table. Suddenly a loose piece of board is caught by the saw and slid along the table with enormous velocity against his abdomen before his muscles have time to contract to protect it. I have come to regard such an injury as this as almost diagnostic of rupture of the intestines.

It is rather interesting that so large a proportion as four out of the nineteen cases should have been due to this accident, and the knowledge of that fact is valuable to the surgeon, who should be on the lookout for this injury wherever an accident of this character occurs. All of these cases were conscious of having had a severe blow, but two of them walked about after the accident. One went to a physician's office, was told there was nothing the matter, and went to work the next day. A few days later the physician whom he had consulted happened to be in the pathological department of this hospital and saw his patient on the autopsy table. He had died in this hospital from rupture of the intestine. Two of the five cases that the writer has personally operated upon for rupture of the intestine were due to this accident.

The second of the four classes into which these cases fall are blows upon a hernia. This class also includes four cases. Here, as stated above, the conditions are such that a slight blow may be sufficient to rupture the intestine. Case 4 is

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interesting in this connection. Here an engineer was at work over his fire with a heavy bar, when the bar got caught, then sprung free and struck the pad of his truss. The blow was not a heavy one, but was sufficient to rupture the intestine. In this case the seriousness of a blow over a hernia was not realized; the patient was not operated upon for twenty-four hours after the injury and died of general peritonitis.

The third class of cases is due to horse-kicks on the abdomen. This class includes three of the nineteen. The kick of a horse furnishes all of the conditions necessary to rupture the intestines, namely, a blow both rapid, violent, and unexpected, so that the muscles have no time to protect the intestines against it.

The fourth class includes five of these nineteen, and the injuries are due to falls. Three of them were falls from a considerable height, and were accompanied by concomitant injuries. These cases are naturally serious, the mesentery is frequently torn as well as the intestines; and they are necessarily apt to be fatal. Two of the cases were due to a collision between the pole or shaft of a vehicle and the patient, who was riding a bicycle. Here the favorable conditions for rupture of the intestines are sufficiently evident. One case was that of a man with a distended abdomen, who fell, striking his abdomen against a curbstone when he was drunk. In cases of this kind it is probable that distention is a favoring element to rupture.

Diagnosis. — The symptoms which at first ensue upon a rupture may be, and often are, so slight that the surgeon feels a false sense of security. He judges that probably no harm has been done, and the patient is left until a general peritonitis is developed before he is operated upon. It is for this reason that it seems to me that a knowledge of the common etiology of these cases is important.

In cases which have been subject to injuries of this sort, an exploratory laparotomy should be done without waiting for an absolutely certain diagnosis, which also means the almost certain death of the patient. After these blows upon the abdomen by a board from a circular saw, or by a horse's hoof, the patient is very often faint, sometimes vomits, and

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then the rapidity with which the symptoms come on depends upon the rapidity with which the intestinal contents are poured into the abdomen. If the rupture is a small one, as not infrequently happens, it may be nearly closed by protruding mucous membrane. Here the pain, tenderness, muscular spasm and temperature indicative of peritonitis may develop gradually, as in the case of general peritonitis, in which the patient went to work the day after the fatal accident happened to him. Or, if the rupture is a large one, the rapid extravasation of intestinal contents brings into immediate evidence the symptoms of general peritonitis and leads to immediate operation.

The peritonitis must be quite general before the patient looks badly. The pain, tenderness, muscular spasm and slight rise in temperature, and the fact that the patient is getting worse, should be sufficient for immediate operation without waiting for the facies which practically always indicates that peritoneal sepsis has progressed to such an extent that no operation will control it.

The ruptures here reported, all but one, concerned the small intestine, and most of them the lower part of the small intestine, probably because the coils of the small intestine lying in the lower part of the abdomen are there exposed to compression against the pelvic bones as well as against the vertebræ. The only rupture of the large intestine in this series was case 19, where the injury resulted from a fall from a team, the patient being run over by the wagon wheels. Here the injury was to the splenic flexure of the colon, which was not improbably caught between the ribs and the verte bral column or between the wheel and the vertebral column, as the lower ribs were compressed.

Makins,* in an extremely interesting analysis of twenty-one cases occurring at a London hospital during ten years, found that sixteen involved the small intestine and five the large intestine. In nine the point of impact was indicated by a local bruise or abrasion, and in eight of the nine this local injury was below the umbilicus. He concludes, I think correctly, that blows below the umbilicus are more apt to

* Annals of Surgery, 1899, xxx., 5, p. 137.

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rupture the intestine, because the bony walls of the pelvis, as well as the vertebral column, here offer counterpoints for compression.

Blows above the umbilicus, exactly in the median line, may rupture the intestine by compression against the vertebral column. Blows in the lumbar region are more apt to cause rupture of the solid viscera, kidneys, liver or spleen. Analysis of these cases shows that in eleven the injury was below the umbilicus. In six there was a definite contusion of the abdominal wall; in four the blows were upon herniæ, and in one the blow was known to have been in the left iliac region. Two only were known to have been blows above the umbilicus. One case (case 15) was a tear due to a blow on the back and fall forward, and in the remainder the place of the injury is unknown.

The rupture of the intestine, in my experience, is usually found directly under the spot where the blow upon the abdomen was received, and slight reflection will make it evident that, where the intestine is ruptured, here the abdominal wall is also contused and may contain a hæmatoma. These two facts are the reason for what seems to be an important indication for treatment.

If there is a slight contusion upon the abdominal wall to indicate where the blow fell, or if there is any other definite evidence of the location of the injury, instead of incising over the median line we should make an incision over this spot. This method of procedure was advocated by Spaeth in 1887, but has not been concurred in by most of the subsequent writers. The writer's personal experience, however, leaves him no doubt regarding the advantages of this method.

In case 6 of this group the blow had been received in the left groin from a board from a circular saw. The writer made the incision in the median line, easily found the rupture, sutured it and drained the abdomen. The patient died from an abscess due to the infection of a hæmatoma.

Directly under the seat of the blow, which was in the lower left iliac region, as was indicated by a contusion of the abdominal wall, an abscess was found at autopsy just under

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the peritoneum, undoubtedly due to an infected hæmatoma. If the writer had incised over the seat of injury, he could not have failed to find and clear out this subperitoneal clot. By cleaning it out and draining the cavity he has no doubt that this patient's life could have been saved.

In case 14, where the patient suffered a horse-kick over a right inguinal hernia, that is what was done. The incision was made directly over the hernia. The œdematous and ecchymotic tissues were incised and drained, whereas, had the incision been made on the median line, even though the rupture had been found and the peritonitis averted, a fatal infection might have taken place in the hernial sac and surrounding tissues. These cases seem to indicate clearly that we should incise over the point of injury. Not only will we be able thus to treat concomitant injuries to the parietes, but in nine cases out of ten the ruptured coil will be found directly under the incision, and it will not be necessary to drag it through peritoneum, which is perhaps not already infected.

In regard to these cases of blows upon a hernia, when the blow has ruptured the intestine the contents escape into the hernial sac, and not infrequently the coil itself, emptied and collapsed, slips back into the peritoneal cavity. This was the case in case 14, also in case 2, where the rupture on autopsy was found in the abdomen, though some of the intestine remained in the hernial sac.

In case 3 the ruptured intestine had slipped back into the abdomen, leaving the hernial sac empty of bowel, although containing intestinal contents. In case 4, also, the two portions of the intestine were found in both cases in the abdomen and not in the hernia; therefore we may be fully assured that in ruptures in a hernia we shall probably find the rupture in the abdominal cavity and not in the hernial sac. It will probably lie just above the inguinal ring, and can best be reached by making the first incision over the hernial sac and carrying it upward into the abdominal cavity.

Fifteen of these cases were operated upon, three of the four that were not operated upon occurring before 1895 and the diagnosis not being made. In one of them there was no

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history of an injury, but autopsy showed that such an injury must have occurred. The only other case that was not operated upon came to the hospital in a moribund condition, too late for operation to offer any hope. Of the fifteen cases, seven recovered and eight died, which seems to me not a bad showing considering the nature of the injury. Of these that recovered all were operated upon within fifteen hours, three being operated upon within three hours of the accident, one within four, one within nine, one within twelve, and one within fifteen hours of the accident. The only case which was operated upon early and died was case 6, which, as has been stated above, died from an infected hæmatoma.

In falls from heights the extent of the other injuries is apt to mask the abdominal condition, and even where rupture of the intestine is recognized and successfully operated upon, the concomitant injuries are apt to cause death. Three of the four cases in which the injuries were caused by falls from heights died.

In case 15, which has been previously reported by Dr. Bottomley,* the injury was due to a patient being thrown on his face by a blow in the back by the pole of a team. Here the rupture was close to the duodeno-jejunal junction, and it seems as if the movable intestine was actually torn from its fixed attachments. This case, as far as is known, is a unique one. A knowledge of the etiology of these cases seems to me especially important for hospital surgeons, for the reason that, when they are informed by their house officers that a certain kind of accident has occurred, even in case the house officer may not suspect its seriousness, they may find it wiser to see the case than to await the development of symptoms which bring a certainty of diagnosis, and at the same time a prognosis which for certainty, if not for character, leaves nothing to be desired.

The writer wishes here to thank the visiting surgeons in charge of the cases here reported for the privilege of including them in this report. Four of these cases have been reported by Drs. Nichols and Bottomley and the writer in a

* Medical and Surgical Reports of the Boston City Hospital.

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previous City Hospital report, but are included in this series in order to make it complete.

Case No. 1. — December 10, 1887. Dr. Bradford. D. M., twenty-five years old. About 9 A.M. was struck in the abdomen by a piece of timber three feet long which flew from a circular saw; in some pain; lies with legs drawn up; large bruise in right iliac region; vomited; distended, and died seven days after entrance.

Case No. 2. — 1892. Dr. Gay. D. D., seventy. Has had hernia on right side for some years; is said to have been kicked by his son last night. On entrance his pulse was imperceptible; death in about twelve hours.

Autopsy. — Peritonitis and food free in cavity; rupture of jejunum, longitudinal in direction; one inch long, presenting pouting, everted edges. This rupture was in the bowel, about eight inches above the inguinal ring. The subcutaneous tissue about the hernial sac was filled with extravasated blood.

Case No. 3. — March 13, 1895. Dr. Cushing. N. E. No history; could talk no English. A tense, very tender hernia in right side; in twenty-four hours developed peritonitis; death in four days.

Autopsy. — General peritonitis; rupture with everted edges, one and one-half inches long, ten inches above cæcum; peritoneal surfaces above and below the rupture uniformly discolored and ecchymotic; hernial sac empty of bowel, but contained fecal matter.

Case No. 4. — January 20, 1897. Service of Dr. H. L. Burrell, operated upon by Dr. Thorndike. J. N., an engineer, aged forty years, had had a hernia for years and had worn a truss. As he was at work over his fire with a heavy iron bar, the bar got caught and then got free, and struck the pad of his truss. The blow was not a heavy one. In five minutes he had to lie down, and in one hour he vomited and had general abdominal pain. Abdomen somewhat distended; tender in flanks; over right inguinal ring a slight amount of swelling and tenderness. Twenty-four hours after injury was operated. Fluid stained with fecal matter in peritoneal cavity; intestines red, in places covered with lymph; gas also in peritoneal cavity; two perforations of intestines found about four inches apart. Closed by suture; drainage by gauze into pelvis and lower splenic regions. Died afternoon of operation.

Case No. 5. — September 13, 1897. Service of Dr. Gay. C. F., thirty-one. Fell about thirty feet; marked shock; abdomen distended; distinct spasm; dulness in both flanks; vomiting; fracture of both bones of the left leg. Incision four and one-half inches long below umbilicus; peritoneum filled with grumous material. Perforation found high up in small intestine and closed with Lembert sutures. Fracture of pelvis at symphysis felt with finger in abdomen; lavage; drainage. Death about eighteen hours after operation.

Case No. 6. — November 27, 1897. Service of Dr. Monks. Operated upon by writer. W. E., aged forty-seven. While at work, a piece of timber flew from a circular saw and struck him in the abdomen. He felt faint and vomited, but was able to walk about and soon felt better.

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Was taken home in a carriage, but soon after reaching there felt badly, suffering from abdominal pain and nausea.

Physical Examination. — Looks sick; drowsy; abdominal wall retracted, but very rigid; generally tender, but more so in the left iliac region, where there is a slight contusion; dulness over pubes on both sides extending to left iliac region; operation about four hours after injury.

Incision from just to left of umbilicus, down nearly to symphysis; subperitoneal fat ecchymotic; a brownish, foul-smelling fluid in peritoneal cavity; an oval rent found in lower part of ileum, one inch by one-half an inch. A lead pencil sized perforation was found close beside the main opening. Intestinal contents free among intestines, and fibrin flakes here and there. Resection and end to end Lembert suture was done at point of injury; irrigation and drainage of pelvis with gauze and a glass tube. After two days' vomiting the patient began to improve, and did fairly well for three days. Then the pulse and temperature began to rise, and death occurred on the eighth day.

Autopsy showed an abscess cavity, evidently a broken-down blood clot, between the peritoneum and the ramus of the ileum and the bladder, on the left. This clot had evidently been infected by the intestinal contents, had suppurated and finally burst into the peritoneum. A small opening through the peritoneum was found on the abscess, and there was evidently a peritonitis spreading from this.

Case No. 7. — December 1, 1897. Service of Dr. F. S. Watson. H. M. S. collided with the pole of a hack while riding a bicycle. Pole struck him in abdomen, throwing him several feet backward. Pain at first severe, but subsided; vomiting began about an hour and a quarter after the accident; abdomen tender; muscular spasm, especially on left. Operated immediately on entrance. Incision three inches long in median line above umbilicus. On opening peritoneum a small quantity of thin, bloody fluid escaped. A moderately large tear in the small intestine was dealt with by resection of the torn portion with a V-shaped piece of mesentery. End to end suture; lavage; closure of abdomen without drainage; recovery.

Case No. 8. — August 18, 1898. A. H., nineteen years old. Three days ago patient was struck in right iliac region, just above crest of ileum, by a piece of joist which was thrown by a circular saw; walked to a physician's office, who stated that there was no serious injury. The next morning felt well enough to go to work, but had to leave early on account of beginning of abdominal pain; walked home and vomited several times; entered hospital three days later, pulseless, and dying of general peritonitis.

Autopsy. — General peritonitis; round perforation in small intestine, about 15 cm. above the ileocecal valve. Internally the mucous membrane shows a circular opening, with lacerations extending laterally transverse to the intestine; some slight hemorrhage in the neighborhood.

Case No. 9. — April 26, 1900. Service of Dr. Gavin. Operated upon by Dr. George H. Monks. P. C., thirty years, while riding a bicycle was struck by a team, one of the shafts striking him in the left chest and throwing him to the ground; unconscious; exact method of injury doubtful. On admission apparently no marked shock; abdomen rigid;

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nothing abnormal felt; constant vomiting. Operated within twelve hours. Median incision; stained, cloudy serum in peritoneum; irrigation; drainage, both flanks and median line. Death in twenty-four hours. Post-mortem showed a tear three quarters of an inch in length a short distance below the duodenum.

Case No. 10. — July 20, 1901. Operated upon by Dr. Lund. M. P., seven years, male. Fell from bridge about 5 P.M., ran home crying, complained of severe pain in abdomen. Vomited once; had a chill and became feverish in the evening; slept fairly well and was able to get up for a drink of water in the morning; pain less severe; abdomen tender; no movement of the bowels. A physician was called, who ordered the boy to the hospital.

When seen at the hospital, he lay with his legs drawn up; face pale; expression anxious; tongue dry and hands and feet cold. Pulse 140, weak and compressible; temperature 99.5°; abdomen not distended, rigid on palpation, especially on left side, where there was marked tenderness; ecchymosis over crest of left ileum.

An incision was made under ether anesthesia twenty hours after the accident, over the outer border of the left rectus, just below the umbilicus. On opening the peritoneum, there was an escape of dark brown serum containing a few flakes of fibrin. The intestines on the left side were injected, and presented flakes of fibrin on the surface. A coil was found in the left hypochondrium wrapped up in the omentum; this coil was torn from its mesentery for about three inches, and in its centre was a large perforation. It was denuded of peritoneum. The damaged portion of the intestine was excised, the ends being brought together by a Murphy button, reinforced by a few sutures of fine silk. The mesentery was united by two silk sutures. The boy was in severe shock and pulseless during the latter half of the operation, which took thirty minutes. The abdomen was washed out and drained with iodoform gauze, and the wound was closed with sutures of silkworm gut. The drainage was carried into the left hypochondrium and into the pelvis.

The boy was stimulated freely, but did not rally, and died two and a half hours after the operation.

Case No. 11. — December 21, 1901. Service of Dr. W. P. Bolles. Operated upon by Dr. Bottomley. A. DuF., eight years. Coasting, ran into a team; horse kicked him in the abdomen; operated within twelve hours; had vomited four or five times. Area of ecchymosis, with slight abrasion, between costal margin and iliac crest on right; slight ecchymotic area just to right of upper lumbar spines; no distention; dull on percussion everywhere, except in epigastrium; general tenderness and spasm most marked on right. Ether; median incision. Cloudy, slightly bloody fluid in peritoneum; perforation about one inch from mesentery and about mid-point of ileum, size of a lead pencil, with everted edges; apparently not much escape of fecal matter. Suture of perforation; irrigation; drainage of pelvis and flanks; recovery. Dismissed from hospital February 3, 1902.

Case No. 12. — May 6, 1902. Operated upon by Dr. Lund. A. C., forty-six years. Seen in consultation with Dr. A. B. Brown of Newburyport and Dr. Spaulding of Salisbury. At 4.30 on May 5 he was

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thrown from his carriage; thinks he struck his abdomen against the whiffletree and possibly was kicked in the abdomen by the horse. When seen by Dr. Spaulding, at about 7 P.M., he had vomited; was in a state of moderate shock; pulse 100 and of good quality; had a small red spot about two inches to the right of the umbilicus; distinct spasm and tenderness on pressure over the right side of the abdomen. During the night he vomited three times, and the bowels could not be made to move by enemata.

In the morning he was found to be well; facies excellent; pulse 100 and rather compressible; temperature 100°. On pressure in the right lumbar region there was moderate tenderness and spasm.

Under ether an incision three inches long was made through the outer part of the right rectus, the centre being just below the umbilicus. On opening the abdomen there was an escape of turbid serum. Coils of intestine below the incision were injected and coated with flakes of fibrin. On withdrawing several coils from the abdomen a perforation about the size of a lead pencil was found, which was partly closed by the pouting of the mucous membrane through it. This was closed by interrupted sutures of fine silk. The peritonitis was found to involve the pelvis and the right hypochondriac region, from which a considerable amount of turbid serum was washed out. After thorough flushing, the intestines were returned and the wound sutured. Thorough drainage was established by a glass tube and gauze drains at the lower end and the upper angle of the incision. Recovery.

Case No. 13.— August 20, 1902. Operated by Dr. Nichols. A. A., twenty-two. At 5.30 he was kicked in the "pit of the stomach" by a horse. He was standing four or five feet from the horse's feet; was knocked down; lost consciousness for a moment. The immediate pain was severe, but increased later; vomited at intervals of fifteen minutes, and raised some mucous mixed with bright blood, about a cupful. He was brought to the Relief Hospital three hours after the accident.

He weighed about one hundred and eighty; was thin and muscular. Very restless, mind clear; lay flat upon his back with legs fully extended; face pale with a dusky tinge, looked pinched; tongue clean and moist; temperature, 99.6°; pulse, 100, fairly strong, regular, but compressible. On the right lower abdominal wall was a very slight redness and abrasion. Abdomen slightly retracted; general abdominal pain and tenderness, not extreme, no point of marked local tenderness; abdominal muscles extremely rigid; slight dulness in right iliac region.

Diagnosis.— Rupture of intestine. Operated under ether three hours after accident.

An incision two and a half inches long was made in the median line half way between the umbilicus and the pubes. On opening the peritoneum, considerable cloudy serous fluid, tinged with blood, escaped. The intestine was very much injected and covered in places with small amounts of fibrin. An oval perforation, half an inch in length, was discovered in the ileum opposite the mesenteric attachment, eighteen inches from the ileocecal valve, from which fecal contents escaped. The incision was closed with a continuous right-angled silk suture, reinforced with interrupted silk sutures. No further rupture was

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found. The peritoneal cavity was thoroughly washed and much fecal matter was found. Irrigation was continued until the fluid was perfectly clear. Drainage was effected by glass tubes and gauze drains. Recovery.

Case No. 14. — September 24, 1902. Operated by Dr. Lund. F. J., twenty-eight. Admitted to the Relief Hospital about 1 P.M. Stated that he was kicked in the abdomen by horse at about 6 A.M. He was thrown ten feet and was unable to rise. Patient had a right inguinal hernia, probably containing a loop of the intestine. One of the horse's hoofs struck over the sac and the other struck the right lumbar region. No vomiting; slight nausea at times. Accident at Weston, Mass. On advice of a physician he was brought to the city on a stretcher by train.

When seen at the hospital, the patient was well developed and nourished; lips pale; cheeks drawn, pinched and pale; temperature 98.6°; pulse 68. Enema produced a good movement of the bowels. Chest negative; abdomen full, but not distended; some muscular tenderness and spasm in lower half of abdomen, most marked in median line. Point of most tenderness over right external ring, where there appeared considerable swelling apparently connected with hernial sac.

At 3 o'clock under ether an oblique incision was made over the inguinal canal and the tissues about spermatic cord were found œdematous and ecchymotic. The hernial sac was exposed and incised and found to contain clear fluid. Then the aponeurosis of the external oblique was slit up over the sac and incision carried up to the internal ring. Pressure on abdomen caused extrusion of turbid, light brown fluid from abdominal cavity. Incision, therefore, carried up through external and internal oblique and transversalis muscles, a distance of two inches, considerable turbid fluid escaping from the abdomen. Numerous coils of small intestine, some distended and some collapsed, deeply injected and partly covered with delicate flakes of fibrin were found. A laceration three-quarters of an inch long was found opposite the mesenteric border, crossing intestine obliquely. After removing the fibrin from the edges of the laceration, it was closed with a double row of continuous fine silk sutures.

In one of the deeply ecchymotic spots in the neighborhood, along the mesenteric border of the bowel, it looked as though perforation were imminent. This was inverted and sewn with interrupted Lembert sutures, as was also another spot whose integrity appeared to be dubious. No further injury was found, although several contusions of the mesentery were noted. The upper part of the wound was closed by silkworm gut sutures, drained by gauze and glass tubes. Convalescence was uneventful.

The incision was made into the hernial sac in this case for the reason that this was the known position of the blow upon the abdominal wall.

Case No. 15. — Operated by Dr. Bottomley. Fisherman, forty years old. Brought to the Relief Hospital; said he was struck in the back "just below the shoulder blade" by the shaft of a team, knocked down. Felt faint, but was not unconscious. Severe abdominal pain, chiefly above the umbilicus, followed the blow; walked about some; took a carriage to the ferry; after crossing, walked three-quarters of a mile to his home, where he took a cup of tea, which brought on the first

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attack of vomiting. The pain increased, and he called a physician, who diagnosed the case as distended bladder, which he found, and sent the patient to the hospital. Only one attack of vomiting since accident, and only subjective symptoms, severe abdominal pain.

He was a well-built, well-nourished man; pulse 92, but unsatisfactory in character; temperature slightly subnormal; lips pale, and countenance ashen and pinched. Severe pain, which successful catheterization did not relieve; abdominal wall not contused, was rigid, distended; muscular spasm and tenderness general; no dulness anywhere. On his back, over the left tenth rib, about three inches from the median line, was a contused area a little larger than a quarter, which was tender and indicated the point of impact of the shaft. Patient refused immediate operation until eighteen hours after the accident, when, having grown steadily worse, he consented. Then all signs of a diffuse general peritonitis showed, except vomiting. Pulse 112 and weaker.

Under ether a three-inch incision below the umbilicus, and later extended two inches above the umbilicus, was made. Upon opening the peritoneum considerable dark brown fluid escaped, which was bile-stained and contained many flakes of fibrin and particles of partly digested food. The small intestine presented an angry looking, congested peritoneal coat and a general very free formation of fibrinous exudate. A perforation, large enough to easily admit the tip of the forefinger, was finally found in the jejunum opposite to its mesenteric attachment; through it there was a very free escape of intestinal contents. Extending downward from it in the long axis of the intestine was a tear through the peritoneal coat of the bowel one and one-half inches long.

The closure of the perforation, by a purse string suture of silk, was a matter of considerable difficulty. The longitudinal tear was repaired with a single row of the Cushing right angle suture. No other injury was found. Several ounces of Epsom salts were injected into the cavity of the small intestine. The peritoneal cavity was irrigated with hot salt solution, and the abdominal wall closed, except at the lower end, where space was left for the passage of two glass drainage tubes.

Patient failed rapidly during operation despite stimulation. The head of his bed was raised and he was given salt solution intravenously. He reacted rapidly and well; no vomiting followed; pain ceased; and by evening his pulse was better in quality than since his admittance. Six hours after operation, pelvis irrigated and more cloudy fluid and fibrinous exudate washed out. Rectal feeding started. He continued to improve until afternoon of second day, when a severe diarrhœa set in. This was controlled by opium, but pulse began to rise rapidly. Reacted again, and on the morning of the third day his pulse was steady at 84. Went to pieces again in the afternoon and did not rally, but died about seventy-two hours after operation.

Case No. 16. — November 7, 1902. Service of H. L. Burrell. Operated by Dr. J. C. Munro. J. C., age thirty-seven, fell from a bridge twenty-five feet to the ground. Forty-five minutes later at Relief Station with marked shock; pulse 80, regular; abdomen full, tender on left side; no external evidence of injury; one hour and forty-five minutes vomited. Operated two hours and forty-five minutes. Incision

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not specified; jejunum found ruptured in two places near together, with pouting mucous membrane; about five inches of bowel excised; Murphy button; thorough irrigation of abdomen.

Convalescence complicated by a pelvic abscess which was drained on November 19. A fecal fistula followed. Discharged December 26, with small sinus discharging no pus; in good general condition.

Case No. 17. — March 14, 1903. Service of Dr. H. L. Burrell. Operated upon by Dr. Crandon. W. S., forty-six years, had been drinking brandy for four days previous to injury. For five days he had had no movement of bowels. Stumbled and struck abdomen against curbstone while drunk; got up and walked home. In six hours sobered off and began to vomit and suffer from abdominal pain; twenty-four hours later in very poor condition; distended abdomen; vomiting; pulse 140, almost imperceptible at wrist. Abdomen opened and brownish fluid washed out. Perforation not found at operation, as the patient was in too poor condition to do more than flush out hurriedly. Died in a few hours.

Case No. 18. — November 3, 1904. Service of Dr. H. L. Burrell. Operated upon by the writer. H. L. P., twenty-one. While working at a circular saw a piece of board lying beside the rapidly revolving saw was caught and thrown violently against his abdomen.

On admission there was general rigidity, but the spasm was apparently all voluntary, and general tenderness slightly more marked just below the umbilicus; pulse 120; no marked pain. Two hours after entrance a severe crampy pain. Pulse began to rise and pains appeared peritoneal; vomited. Operation three hours after entrance by writer.

Median incision below the umbilicus. Abdomen contained thin, cloudy fluid, and occasional fibrin flakes in intestine. On a coil of ileum directly beneath the umbilicus was a ragged tear about three-quarters of an inch long, and one and a half inches from it an area where the peritoneum had been stripped off the muscular coat over an area two inches by one inch. This looked as if it might be due to stretching sufficient to burst the outer or peritoneal coat. The rent had everted edges. It was inverted and sutured transversely to the lumen of the bowel, and the peritoneum was sutured also over the denuded area. Linen thread was used. Drainage of pelvis and elevation of head of bed. Left the hospital well in eighteen days.

Case No. 19. — July 21, 1905. Service of Dr. Monks. Operated upon by Dr. Hubbard. J. C., thirty-five, entered the hospital July 21, 1905. One hour before entrance, he fell off a team between the wheels, the hind wheels passing over his chest. General condition fair; alcoholic odor to breath; pulse 84; pupils, equal and react; considerable tenderness over abdomen, most marked in splenic and suprapubic regions; involuntary spasm in this region; no dulness in flanks; splenic and liver dulness not observed. Shortly after entrance he vomited about a quart. Two and a half hours later his pulse was 120. He had nausea and vomiting; pain in bladder region; no dulness in flanks.

Crucial incision was made through the fibres of the rectus. On opening peritoneum a chocolate-colored fluid escaped. The small intestine was examined for its entire length. Toward the end of the search pieces of feces were found in the peritoneal cavity. A rupture was found

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in the splenic flexure of the colon. Left rectus was practically cut across. It was impossible to suture the rent because of the deep situation of the splenic flexure, which prevented access to it. Gauze packing was therefore carried down to it, and the wound sutured about it. The shock was excessive, and the patient died about six hours after the operation.

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IX.

INVERSION OF THE UTERUS, WITH REPORT OF TWO CASES REPLACED BY LAPAROTOMY.*

By L. V. Friedman, M. D.

Inversion of the uterus is that form of displacement in which the uterus is turned inside out. For some hundreds of years (2) it has been the custom to describe two forms — partial and complete. In the partial form, the fundus, though indented, does not pass through the os externum; in the complete form the fundus has been expressed through the os, so that the entire uterine cavity is obliterated. As both the method of diagnosis and the treatment vary with the degree of inversion, I would suggest that the first be called "initial," the term "partial" being reserved for those cases in which, although the fundus has passed through the os externum into the vagina, the inversion has not proceeded far enough to obliterate the uterine cavity. This is in accord with the German terminology (3). From a study of reported cases and from my own experience in the two cases here reported, I am led to believe that this is by far the most common form, and I shall discuss it more fully in considering diagnosis. Any consideration of etiology must be preceded by a word as to the pathological findings. Authoritative pathological examinations are necessarily rare, since in recent years it has usually been possible to replace the uterus instead of removing it. Peterson (4) examined the tissue cut from the sides of his anterior incision; these showed an increase of connective tissues in the muscularis with sclerotic changes in the

*I wish to acknowledge my deep obligation to Drs. Charles M. Green and Franklin S. Newell, my seniors on the Gynæcological Staff at the Boston City Hospital, for the opportunity of operating upon the cases here reported, and particularly for their skilled assistance (from the vaginal side), without which my procedure would have been futile.

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blood vessels. In the meshes of the fibrin deposit on the mucosa were found cell debris and leucocytes. It has been generally assumed as an hypothesis that inversion occurs only where there has been paralysis of the uterine musculature at some point, which, being inactive, is forced in by the contractions of the surrounding muscular tissue (5). Such paralysis is most apt to occur at the placental site, and we have consequently a large proportion of puerperal cases. The statistics of Crosse (6), based on four hundred collected cases, are accepted to-day and show about 88 per cent. puerperal; 12 per cent. due to fibroids and isolated instances of other causes. Given the pathological paralysis, almost any muscular exertion, such as coughing or sneezing, may prove an exciting cause. The commonly accepted causes are: Traction on the adherent placenta, precipitate delivery, short umbilical cord, traction by tumors. The remarkable cases attested by Baudelocque, Parker and others, of inversion of the virgin uterus in the absence of tumor, are probably to be explained as following an unrecognized dilatation by hematometra. In the great majority of cases the inversion begins either centrally in the fundus, or in one cornu, but another form has been established which is due to a progressive eversion which begins at the cervix. The condition is probably much more frequent than is indicated by the oft published statistics of Denham (7), who found but one acute inversion in 100,000 births in Dublin, and of C. v. Braun, who did not meet with an instance in 250,000 births in Vienna.

Inversions are considered as acute or chronic. It is impossible to set a definite time limit for the acute stage, but it is probably less than twenty-four hours, and the change in the uterine tissues, which constitutes the essential feature of the chronic condition, may take place within a few hours of the inversion.

Acute inversion is usually accompanied by sharp pain, shock, hemorrhage and collapse. Yet any one or all of these symptoms may be missing. This is particularly true of pain, as inversion is apt to occur while the patient is still unconscious from the anæsthetic given at the close of normal labor or for operative procedures.

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Chronic inversion also may have few or no symptoms, or there may be occasional hemorrhage with consequent anæmia, disorders of urinary apparatus, difficult defecation or constipation and discomfort in walking or standing. Complications may occur in acute inversion, but are more often met with in old chronic cases. Thus in an acute case the inversion may be the result of the expression of a large sessile intra-uterine tumor, in which case it is difficult to establish the upper limit of the tumor, or the beginning of the uterine tissue (8). The complicating tumor may be a sub-peritoneal myoma which is mistaken for the fundus in normal situation (9).

In chronic cases, adhesions may form between the extruded endometrium and the cervix or vagina. There may be adhesions between the peritoneal coats abnormally in contact in the peritoneal crater or between the round ligaments, Fallopian tubes and the peritoneal lining of this crater. The contraction of the cervical ring may be sufficiently tight to cut off the circulation and cause gangrene of the uterus and of the round ligaments and Fallopian tubes in so far as they lie below the cervix in the crater. Finally, where the blood supply is merely diminished we may have atrophy of the inverted fundus, the endometrium of which has been converted into a tissue resembling skin through its constant friction with the vaginal walls or between the thighs.

In spite of the fact that immediate reposition is usually easy and safe, the prognosis in acute inversion probably will remain always a grave one. Death may occur in a comparatively short interval as a result of extreme shock, or of sudden overwhelming hemorrhage. In the remarkable case reported by Anderodias (10), he saw the patient less than two hours after the inversion occurred, and though reposition by taxis was comparatively easy, the patient collapsed and died instantly after the manœuvre. Crosse gives a mortality of 73 per cent. in 109 cases; Winckel's more modern statistics show a mortality of 22 per cent. in 54 cases.

Considering unrecognized instances, the mortality is probably higher than the last named percentage. If the

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patient lives through the acute stage, her life is endangered by the possibility of acute infection of the endometrium, and later by periodic and irregular hemorrhage and by the grave operative risks incurred in seeking relief for the condition. A certain number of spontaneous repositions are recorded. Thomas (11), in a classical article on the subject, quotes twelve such cases, and the following anecdote: "There is nothing easier than the rejection of the testimony of others, and the discrediting of deductions which we ourselves have not drawn. When De La Barre presented his case of spontaneous reposition to the Academy of Surgery, Baudelocque was appointed a committee to examine into it and reported that it was 'totally false.' Some years afterwards he met with a very similar case, and yielded to the evidence of his own senses a credence which he had presumptuously denied to the assertions of another."

The diagnosis of inversion is usually difficult. Apart from numerous instances where the mass has been excised or morcellated as a polyp without considering the possibility of inversion, many eminent surgeons have erred after the most careful attempts at diagnosis, and in no condition is an error in diagnosis fraught with more danger to the patient. The possibility of inversion of the uterus must be considered whenever a uterine, cervical or vaginal tumor is detected by the physician. Even where the microscopical examination of snippings reveals a fibroma or sarcoma, the possibility of a complicating inversion must be borne in mind.

Velpeau (12) said in regard to this diagnosis: "In some cases doubt is the only rational opinion." Gooch (13), in his essay, writes: "When partially inverted, the tumor in the smoothness of its surface, the roundness of its body, the narrowness of its neck, and its being encircled by the orifice of the uterus, sometimes exactly resembles polypus of the fundus."

The differential diagnosis lies between inversion, uterine tumor (polyp, fibroid or sarcoma) and procidentia. The last named should be ruled out by a careful examination, but a tumor may deceive in various ways. The orifices of the tubes are by no means always obvious. Where the fundus

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remains in the vagina they cannot be detected, and even where the fundus is outside of the vulva these minute orifices, buried in the thickened endometrium, must be demonstrated with difficulty. The sound is not infallible, as a fibroid polyp may be adherent throughout the cervical circumference, and thus prevent the entrance of the sound. In partial inversion, even a fortnight after labor, the sub-involuted uterine cavity may admit the sound to the normal depth, though its fundus has passed through the os. During a protracted examination the uterus is apt to remain in a state of tonic contraction, when it is so hard as to simulate, not merely the body of a fibroid, but also its pedicle. The detection of contractions in the mass and its relaxation under full anæsthesia may prove a valuable aid to diagnosis. The differentiation of the subjective sensations of the patient when the mass is touched is certainly of doubtful value. Through a very thin and much-relaxed abdominal wall under full anæsthesia it may be possible to detect the depression or crater where the fundus should be (this was true in one of my cases, but not in the other), but where the ring is tightly contracted, filled with both round ligaments and both Fallopian tubes, and capped by the ovaries, there is no depression to be felt. When not in a state of contraction, the inverted uterus, if grasped and held by the examining hand, becomes distinctly diminished in size, and considerable bloody serum is expressed from the very œdematous endometrium. In neither of my cases was there sufficient bleeding, as a result of examination and taxis, to be worthy of note. As inversion may occur after labor without pain, hemorrhage or pronounced shock; the favorable minutes for replacing may have elapsed before either patient or attendant is aware of the serious complication. Consequently, the obstetrician must always assure himself immediately after the delivery of the placenta that the spheroid of the fundus is convex, and this, fortunately, it is usually easy to do, because of the marked relaxation of the abdominal walls. Where the patient has complained of sharp pain during a forcible expression of the placenta, or where this event is followed by hemorrhage, if the uterus cannot be outlined by abdominal

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palpation, a careful vaginal examination is indicated. It hardly seems necessary to reiterate the prophylactic proverb, "do not pull on the cord." Further prophylactic measures are the avoidance of undue force in Credé's method, and the complete abstention from pressure on the fundus while it is relaxed. However, the possibility of spontaneous inversion some hours after the delivery of the placenta has been well established.

Peterson's masterly paper (already quoted) gives a perfect summary of the methods of treatment, and I shall detail in regard to treatment only sufficient to make clear my contention for the abdominal route.

In acute inversion, an immediate attempt to replace should be made, if the patient's condition permit. But if there be extreme shock, provided the hemorrhage can be controlled, it is advisable to defer all manipulation. The method of replacing by taxis is simple, but difficult to execute. The theory that the placenta, if still attached to the fundus, should be left as found until after reposition to avoid further hemorrhage, has many objections. Inversion is most apt to occur where the placenta is adherent, and such a placenta can be separated much easier before than after reposition. Further, the placenta increases the bulk of the mass, which is to be returned through the constricted os. After years of discussion there is to-day practical unanimity that the part of the uterus last inverted should be returned first. The patient should be given full anæsthesia. The bladder and the rectum having been emptied, one hand passed into the vagina grasps the inverted fundus and compresses it so as to express serum and reduce its bulk. The fingers of the vaginal hand attempt alternately to dilate the cervical ring and to push through it that part of the uterus which lies just below the ring in the vagina. Meanwhile, with the other hand, counter pressure is made through the abdominal wall, and where the wall is thin and thoroughly relaxed, the fingers may enter the ring from above and aid in its dilatation. In view of the additional shock entailed by prolonged and forcible taxis, and the success of operative procedures, both the force and duration of taxis should be limited sharply.

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Rupture of the vagina and injury to adjacent organs is not a rare sequel of forcible taxis. When reposition has been effected, the uterus should be washed out with hot saline solution, and if it does not contract firmly it is to be packed.

In chronic inversion, taxis should always be given a trial, particularly as it will usually demonstrate whether it seems advisable to attempt to replace the uterus intact by the abdominal method, or whether vaginal section of both cervix and uterus are indicated, because of the firmness of the ring and the solidity of the fundus. If taxis fail, the numerous older methods may well be passed by, and either the vaginal or abdominal section may be chosen. These older methods were not without grave risks; they attempted reposition by taxis with the whole hand in the rectum or with the fingers in the bladder, by the use of prolonged pressure by means of air or water bags or spiral springs. Where the conservative operative measures fail, recourse to hysterectomy or amputation is indicated.

Peterson divides the vaginal operations into four classes according to whether the incision is partial, from cervix to fundus, or complete through the cervix to the fundus, and according to whether the incision is made in the anterior or posterior wall of the uterus.

The ideal vaginal method (known as Spinelli's operation) was used by Peterson. It is the complete anterior colpohysterotomy. The vesico-uterine peritoneal pouch is opened, the cervix is stretched from side to side, and an incision is then made through the cervix and uterus to within one-third inch of the fundus. The uterus is then easily reinverted, and the incision closed as in Cæsarean section.

There are certain objections to the vaginal route. The tubes and round ligaments are exposed to vaginal contamination and then immediately turned free into the abdomen. As both tubes, round ligaments and sometimes a loop of bowel are packed tightly into the crater, there is the risk of injury to these organs in making the incision. If the vaginal incision is made posteriorly, there is apt to result an adherent retroversion; if made anteriorly, we have the undesirable

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vaginal fixation. Finally, there is the possibility of a rupture of the uterine scar in a subsequent pregnancy.

In 1869, T. G. Thomas published an account of a case successfully treated by abdominal section and intra-abdominal dilatation of the cervical ring. This case was a chronic inversion of two years' duration. Subsequently he reported a second case of eight months' duration, in which reposition was equally successful, but the patient died of peritonitis some days later. Peterson collected fifteen cases of inversion treated by the abdominal route. Of these eight were successful and seven complete failures. (It does not seem just to consider Thomas' second case a failure, although it resulted fatally.) Of the eight successes, three promised failure until the ring was incised. I have not been able to find any record of a similar operation since the publication of Peterson's paper. Counting Thomas' second case as a mechanical success, and adding my two cases, we have a successful percentage of 73 per cent. This compares poorly with the record of Spinelli's operation, performed six times with six successes. However, if due allowance is made for the small numbers upon which these statistics are based, and for the constant recent improvement in abdominal surgery, I believe that the abdominal operation will be developed so that its record will be superior to the vaginal. I certainly do not advise the abdominal operation in all cases of inversion. In this, as in all other surgical diseases, the operation must be chosen after due consideration of the individual case.

METHOD OF OPERATION.

The bladder and rectum are emptied. The vagina and uterus are thoroughly cleansed by prolonged washing with warm saline solution. After the usual preparation of the abdomen, it is opened by a median incision, the patient being in the high Trendelenberg position, and so draped with the sterile sheets as to permit access to the vagina. Immediately the bowels are pushed upward and "walled off" by a plentiful supply of gauze. If properly done this decreases greatly the shock and danger of the operation, as it limits sharply the extent of peritoneal exposure and trauma. If

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possible the ring is dilated with the fingers, but if the constriction is so tight as to prevent this procedure the ring is dilated first with a steel dilator of the Wathen or Goodell type, then with Reynold's dilator, which is peculiarly serviceable. In inserting the steel dilator and in dilating, care must be taken to avoid pressure on the tubes and round ligaments. Only moderate force should be used, and this must be regulated by the hand, and not by any mechanical device on the dilator. In a few minutes it will be possible to partly withdraw the round ligaments and tubes, though no force is to be employed in order to accomplish this, and no attempt should be made to reinvert the uterus by traction on the ligaments or tubes. An assistant places the hand in the vagina and begins to carry up that part of the uterus which descended last; as this rises it is caught and held with volsellum forceps. Thereupon the process of dilatation, reinverting and holding are repeated until the operation is complete. No attempt at traction on the volsellum forceps is permissible, as it will result merely in lacerating the peritoneal covering of the uterus or the uterus itself. Progress at first is very slow, but after a certain point is reached the fundus slides through the ring into position. Meanwhile the abdominal assistant has offered counter-pressure against the ring. When the uterus has been replaced, it may be suspended, but as involution proceeds rapidly during the hours following reposition, it is better merely to support the fundus for a few minutes, during which the uterus will begin to contract and retract, and the tubes, if not too long or too severely constricted, will regain practically their normal appearance. The gauze is then removed and the abdomen closed in tiers. The table is then lowered, the foot piece dropped, and two nurses hold the patient's legs in the lithotomy position while a hot intra-uterine douche is given by the vaginal assistant, who has not withdrawn his hand until the operator has felt assured that the uterus would remain in place. The operation does not require more than forty-five minutes from beginning to end. As the work of the vaginal assistant requires more skill and is more important than the abdominal manœuvres, the assistant should be chosen accordingly.

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If this operation can be perfected so as to insure invariable mechanical success, there can be no doubt that it will be an ideal procedure for reposition of the inverted uterus, which is thus restored intact to its original position without violating the integrity of its peritoneal cover. Further, it permits an inspection of the tubes, which in an old case may require resection.

The two cases here reported were treated within thirteen months on the Gynæcological Service of the Boston City Hospital.

Case No. 1. — Mrs. E. R., twenty-nine. American by birth. I. para. Family and past history negative. Five days before I saw her, patient had delivered herself of a living baby after a rather long and difficult primiparous labor. The placenta was expelled naturally without unusual pain or other symptoms. Two hours later she had a moderate hemorrhage, which was repeated at intervals until vaginal examination disclosed a tumor, when she was sent to the hospital. At entrance T. 101.5°, p. 114. Pulse regular, good volume and tension. Abdomen normally tympanitic and not tender. What appears to be a fibroid the size of a large pear protrudes from the vulva, and on vaginal examination is found to pass through the cervix. Leucocytosis of 17,800.

The patient was kept under observation for a few days until the sloughing perineum could be rendered clean. Then under ether a final examination was made which revealed the error in diagnosis. The sound halted when an attempt was made to enter the os at the side of the mass, and careful abdominal palpation revealed the crater. Attempts to reduce the inversion by taxis failed, and after forty-five minutes of careful manipulation the patient was put to bed and prepared for laparotomy on the following day.

Operation. — Patient in high Trendelenberg position. The sterile sheets draped over each thigh separately so as to permit access to the vagina. The abdomen having been opened by a median incision, the bowel was carefully packed towards the diaphragm with gauze strips. The uterus presented the striking picture of complete inversion. Both tubes and both round ligaments were within the inverted cavity, the tubes were deeply injected, purple, and thrice the normal size. The ovaries also wine-colored and tense, rested on the brim of the cavity. The ring was firm and could not be dilated with the fingers. The ring was then carefully dilated with Reynold's dilators, which were inserted so as to avoid injury to the tubes. The assistant's hand in the vagina then began the process of reposition. The anterior wall was raised, and as it came up it was caught and held with volsellum forceps. As each centimeter was gained, another pair of forceps was applied. The traction from above was reduced to a minimum. As soon as possible the tubes were delivered. This gave more room, and after repeating the dilatation with the Reynold's dilators the fundus slipped through the ring. The congestion of tubes and ovaries quickly disappeared.

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The uterus contracted and showed no tendency to invert. However, as the fundus tended to sink back into the fossa of Douglas, it was lightly suspended. When the volsellum forceps were first applied, some traction was made which caused them to tear out and leave a small nick in the peritoneal coat of the uterus. This was readily closed with one stitch of fine catgut.

The operation consumed less than half an hour. It was attended by very moderate shock. At the close of the operation a copious hot intra-uterine irrigation of salt solution was given. Six hours after operation the pulse was 104, temperature 101.4°. The subsequent convalescence was uneventful.

Case No 2. — Mrs. M. H., thirty-seven. Irish by birth. III. para. Patient had an instrumental delivery at her first labor in 1901. Her second labor had been normal (1903). Her third labor was terminated after twenty-one hours by a high forceps operation. Shortly after delivery the placenta was expelled, without aid, and was found still attached to the fundus, which had come down with it. There was little pain, only slight shock, and no hemorrhage. Attempts to replace by taxis having failed, the patient was sent to the hospital, where I saw her twelve hours after delivery.

Patient did not look anaemic, but was pallid. The expression was anxious, the facies typical of shock. The pulse was small and rapid (130), the temperature 100°. The abdomen was normally tympanitic, not distended, not tender. Protruding from the dilated os was a round, hard mass, the size of the fist. The examining fingers passed completely around this mass, which appeared to be attached by a thick twisted pedicle which passed through a tightly constricted internal os. Although no depression of the fundus could be felt, a provisional diagnosis of inversion was made, and, under ether, a short attempt was made to replace by taxis. As this did not succeed, even in part, and as the mass remained hard, I decided that I was dealing with a fibroid. There was no hemorrhage, but the patient's condition was such that all further procedure was deferred until treatment for shock had been instituted.

This was at night. The following morning the patient was greatly improved; under ether a slight depression could be felt in the fundus, and the vaginal mass soft, so that the diagnosis was obvious. Taxis having again failed, the patient was prepared and the abdomen opened.

Operation. — Median incision. The conditions were similar to those described in Case No. 1. The ring was readily dilated with the fingers, so as to admit the half hand; but it contracted again as soon as the hand was withdrawn, so that it was necessary to dilate the ring again and again. Reposition was accomplished with only moderate difficulty in the same manner that was employed in Case No. 1. The entire operation was completed in forty minutes. It was followed by slight additional shock. Six hours after operation temperature 99°, pulse 126. Convalesence uneventful.

Excellent bibliographs are given in the articles of Peterson and v. Winckel.

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X.

A CASE OF IDIOCY IN A CHILD WITH CYSTIC HEMISPHERES.

By W. N. Bullard, M.D., and E. E. Southard, M.D.
[From the Laboratory of the Boston City Hospital.]

The case we here present was one of idiocy in a child born at eight months, which lived three years, displaying signs of sensory, motor and extensive central nervous defect, with numerous convulsive seizures. The autopsy showed an unusual condition of cystic aplasia in the cerebral hemispheres. Some points in the histopathology of the cerebrum, together with developmental modifications in some organs of the trunk, serve to point out a field of work in idiocy.

I. CLINICAL HISTORY.

Dr. Bullard.

In August, 1902, the patient, a girl, nineteen months old, was first brought for an opinion in regard to her condition. She was born and had always lived in a country town in Massachusetts, where her father was a farmer. The parents were healthy, and there was no history of any affection of the nervous system in the family. The mother's first pregnancy was a miscarriage very early. The second was a healthy child. The third was twins, of which the patient was one. This labor was easy in the eighth month; no instruments were used in the delivery; and the child was not asphyxiated. The other twin was still-born. The pregnancy was uneventful, except that in the fifth month the mother was frightened by the cracking of a lamp chimney, thought her child was burnt, and jumped suddenly from the sofa. She

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felt something in the abdomen give way, but no symptoms followed. No cause of the patient's condition was known to her parents. Her eyes had been examined by an excellent oculist, who, according to her parents, had stated that she was blind. Examination of the patient showed that she paid no attention to her surroundings. Her head was normal in appearance, and nothing abnormal could be detected about her eyes. The trunk was not remarkable. There was rigidity of all the limbs, apparently more marked in the upper extremities. The back was held rigid, and there was a long kyphosis in the dorsal region when she lay on her face. The triceps reflexes could not be obtained on account of the rigidity; the knee jerks were not increased; there was no ankle clonus; plantar reflex was good. The child kicked well. The heart was normal. No enlarged glands detected except in the inguinal region. Diagnosis, feeble-minded.

In April, 1903, the patient was seen again. She has now become more rigid and she has lost weight. Is now twenty-seven months old and weighs but thirteen pounds. She will not take her bottle well and cannot be made to take enough food; takes only thirteen ounces a day, and that with much difficulty, "fighting and crying." Is very constipated; feces have to be artificially removed. About six months ago began to have convulsions. In these she draws herself up, becomes rigid, utters a peculiar cry, her face turns red, and her eyes are rolled up. This condition lasts a few seconds, and then she relaxes and returns to her usual state. She has had as many as twenty of these attacks a day, but for the past three months only about three a fortnight.

Physical examination as before: Head small; anterior fontanelle slightly open. The eyes are moved apparently without purpose, outward or inward, but there is no nystagmus; pupils normal in size and equal, and she seems to notice light. The right lower face moves less than the left, and the right corner of the mouth droops. All the limbs are more or less rigid. The arms are somewhat abducted; the forearms flexed at an acute angle on the arms and the fingers are firmly clenched. Both thighs and legs are flexed. The

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toes are in plantar flexion. Knee jerks could not be obtained. No Babinski. Spine as before. Heart negative. Abdomen retracted, wasted.

The following measurements were taken:

Chest circumference	42.75 cm.
Head circumference	39.50 "
Glabella to inion	30.00 "
Ear to ear (middle of each concha) over the head,	27.75 "
Antero-posterior diameter	12.875 "
Biparietal diameter	10.50 "

CLINICAL SUMMARY.

Case of defective girl, born without the use of instruments in the eighth month, one of twins (the other still-born). Slight evidence of consciousness or orientation. General rigidity. Food given with difficulty. Constipation. Convulsive seizures began after twentieth month. Death in thirty-seventh month.

II. GROSS FINDINGS.

Autopsy. — February 4, 1904, by E. E. Southard. Frail, thin girl babe, three years old. Anterior fontanel just perceptible. Face drawn and pinched. Thorax deformed with deep indentation, due to depression of sternum and acute angular bulging of the ribs, more marked on right side. Abdomen scaphoidal. Extremities thin and translucent. Bones visible through skin. Joints everywhere mobile. Spine straight.

Peritoneal Cavity. — Serosa normal. Three supernumerary spleens, ranging to a pea in size, lying at hilum of the spleen. Tranverse colon contains many separate masses of yellowish impacted feces. Stomach spheroidal, 7 cm. in diameter. Bladder reaches umbilicus. Nodes of mesentery scarcely visible.

Pleural and Pericardial Cavities. — Normal.

Heart. — Muscle, endothelium, valves of normal appearance.

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Measurements. — Tricuspid valve, 5 cm.
Pulmonary valve, 3 cm.
Mitral valve, 4.5 cm.
Aortic valve, 3.5 cm.
Left ventricle, 0.9 cm.
Right ventricle, 0.15 cm.

Lungs. — Right lower lobe contains several superficial and deep dark red airless areas, ill-defined, up to 1.5–2.0 cm. in diameter. From bronchi in these areas can be expressed minute drops of yellowish pus. Larger bronchi clear. Bronchial lymph nodes small.

Spleen. — Six cm. long. Capsule tense. Substance firm, not pulpy, with Malpighian bodies evident as red points.

Liver. — Rather small. Blood-content high. Lobule centres congested.

Gall Bladder. — Contains a rather large quantity of green bile.

Gastrointestinal Tract. — Pale, apparently normal throughout.

Pancreas. — Small, fusiform, firm.

Kidneys. — Normal.

Adrenals. — Normal.

Thyroid. — Normal.

Thymus. — No thymus (or large mass of tissue interpretable as thymus) found. Tissues of the region saved.

Head. — Profuse growth of curly, fair hair. Scalp normal. Cranium somewhat abnormal in shape. The occipital bone bulges from the plane of the parietals, as if posterior fossa were relatively larger than the other fossæ. The left posterior quadrant of the vault bulges smoothly from the general surface. There is no evident flattening of cranium in opposite quadrant. Bones can be separated along suture lines with no great violence. Dura tightly adherent to calvarium.

Brain hardened in toto in formalin. Gelatine was injected beneath pia mater of the hemispheres. The cortical wall is thinnest in the posterior halves, and an artificial bulging was produced in the occipital and posterior parietal areas.

Externally the hemispheres are roughly normal and

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symmetrical in shape, but fail to show the usual furrows when viewed from above. The brain is almost smooth at both poles when viewed from above, but a tongue of solid tissue with sulcal markings runs from below upwards and backwards in the locus of the central convolutions. From below the hemispheres are in general of a normal appearance. On section the greater portion of the cortex is found to be replaced by wide cystic spaces, freely intercommunicating and traversed by slender lace-like smooth trabeculæ, a few millimeters in diameter. The system of ventricles is independent of the cortical and central cavitation; but the roof of the lateral ventricles is only a few millimeters thick. None of the ventricles is notably dilated.

The cerebellum shows no reduction in size and has the usual markings.

ANATOMICAL DIAGNOSES.

Extensive cystic spaces in upper portion of cerebral hemispheres, best marked near both poles.

Cranial changes, corresponding to cerebral mal-development.

Backward muscular development.

Supernumerary spleens.

Malnutrition.

Broncho-pneumonia of right lower lobe.

III. MICROSCOPIC FINDINGS.

The microscopic work was carried out with a view of getting evidence on the cause and conditions of the maldevelopment. Resort was taken to general stains (eosin and methylene blue, the anilin blue stain for connective tissue, and the phosphotungstic acid hematein stain *).

The *organs of the trunk* showed a few points of interest. The immediate cause of death was probably broncho-pneumonia, since foci in the *lung*, 0.5 cm. or more in diameter, contain an exudate made up almost purely of leucocytes, and there is edema and cell infiltration of many air spaces else-

* F. B. Mallory. A Contribution to the Classification of Tumors. Journ. Med. Research, xiii., 2, January, 1905.

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where. The bronchial mucosa is as a rule preserved. Near a few bronchi there is a limited amount of lymphoid tissue containing eosinophiles and mast cells. Near the root of the lung there are better defined lymphoid nodules adjacent to plates of cartilage; most of the cells therein have vesicular nuclei and very little cytoplasm, but a few of the cells have nuclei with chromatin murally arranged.

The tissues of the neck were explored for *thymus* tissue, which was found in limited amount and in a few blocks only. The thymus tissue occurs in acini, which are as a rule not over 1 mm. in diameter, but are now and then drawn out into slender masses 0.5 cm. long. The acini are surrounded by dense fibrous tissue without cell infiltration. The acini themselves show extensive fibrous change and in places an undue proportion of small vessels. The thymus lymphocytes are few in number by comparison with the larger cells of the connective tissue series. Only a few acini contain thymus pearls. The total amount of thymus tissue found could be contained in an area 1 cm. in diameter. The character of the tissue suggests advanced atrophy rather than backward development.

Of the other ductless glands, the *thyroid* was well developed, and showed its secretion largely within the gland spaces. The parathyroids were not found, but no extensive search was made for them. In the *hypophysis* small canals lined with low epithelium were found between the glandular and nervous portions. A few gland spaces contain small plugs of colloid material. The number of eosinophile gland cells is low.

The *spleen* and accessory spleens showed, besides central lesions of the Malpighian bodies probably related to the terminal infection, some peculiarities in the pulp tissue. The most striking feature is the presence of numerous nucleated red blood cells (one or more to an oil immersion field) as a rule of normal size, but often larger than normal. These cells are found both in blood vessels and in the sinuses. The majority of cells in the spleen are a series of cells of various size with vesicular nuclei; these cells are probably derived from endothelial cells lining the pulp spaces. Cells

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approximating the adult lymphocyte type occur, but are scarcely more frequent than the nucleated red blood cells. The cells of the Malpighian bodies have nuclei rather larger than lymphocyte nuclei, as a rule of a frankly vesicular character, but in some cases assuming a peripheral arrangement of chromatin. These and other features make the spleen difficult of interpretation; there is no evidence of a destructive process for red cells or other cells.

The *heart* showed no lesion except vacuolation of a few fibers.

The *liver* appears normal. The portal veins and the sinusoids of the lobule centers are congested. The liver cells frequently contain numerous small brown or greenish brown granules. The periportal connective tissue is thin, but dense, and shows now and then a mast cell.

The *pancreas* and *adrenal* are not remarkable.

The *kidney* shows a degree of development corresponding with that of a child of a year or under.

Brain. — The pia mater is everywhere thin and without lesion. Some of the deep processes which accompany vessels into the interior are considerably broader than is appropriate for the calibre of the vessels. These expanded perivascular spaces contain fluid and many phagocytic cells. The spaces are lined by smooth, abrupt walls of compact neuroglia.

It is often possible to follow along the pial processes till they open out upon the broad cystic spaces which make up a large proportion of the cerebrum. There is no free passage into the interior; both hemispheres held injection perfectly.

The larger cystic spaces are lined by a thin layer of fairly dense fibrous tissue. This fibrous lining becomes expanded in the narrower recesses to contain phagocytic cells. The features of a cyst of softening may be roughly reproduced in a few places. The anilin blue connective tissue stain at once corrects this impression by demonstrating a sudden transition between the compact wall of neuroglia tissue (staining red) and the fibrous wall (staining blue).

The characters of the cyst lining scarcely differentiate it at first glance from the pia mater. The pia mater, however,

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contains large vessels, and the cyst lining is supplied, as a rule, with capillaries only. Moreover, the pia mater is backed by a cellular neuroglia readily distinguished from the compact neuroglia behind the cyst lining.

Besides the cystic spaces lined with fibrous tissue there is another kind of cyst, small, lined with ependyma, and associated with, or opening into, the ventricles. These cysts were found chiefly adjacent to the posterior cornu, in a site where they occur, as is well known, not infrequently in apparently normal adults. There is no sign that these accessory ependymal cysts dilate extensively, if at all.

The ependymal cysts and the ventricles show cells supplied with long, hair-like processes, which seem to be attached in many cases to basal bodies near the outer surfaces of the cells.

There are occasional gaps in the ependyma lining the ventricle, and adjacent to these the neuroglia cells may be heaped up in small masses. Corresponding with the smaller gaps in the ependyma, the dense subependymal band of neuroglia is demonstrably interrupted and replaced by a looser tissue, in which the more active neuroglia cells, with expanded cell bodies, are found. In some cases the ependymal rupture demonstrably involves the subependymal tissues as well as the line of ependymal cells.

The architecture of the cortical remains is far less familiar in appearance than that of the ventricular region. The narrow strips of tissue which represent considerable stretches of cortex present a regular stratification, such that the peripheral portion is almost constantly more cellular than the underlying or fibrillar stratum. The appearances suggest that the cellular layer corresponds with the cortical gray matter, and the fibrillar layer with the central white tissue or its neuroglia framework.

There is in many places a thin stratum representative of the subpial layer, in which a few fibrils run parallel with the pia. Among these fibrils are a few vesicular nuclei with prominent nucleoli. These nuclei vary in size, but average the diameter of the blood globule with the same fixation. On approaching the larger pial processes the subpial layer

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of neuroglia gradually thickens, becomes more cellular, and begins to show occasional stouter fibrils. As the layer dips inward along the pial process, it becomes gradually transformed into a less cellular and more fibrillar and compact neuroglia tissue lining the cysts.

There are several variations in the structure of the tissue which represents the cortex. In a given area the structure is fairly regular. The most frequent variation is the appearance of stout bundles of fibres, at regular intervals in the loose intermediary layer of the cortex, running perpendicular to the pia mater. In other places the nuclei accumulate in small foci at regular intervals so that the arrangement of nerve cells in some parts of the normal cortex is imitated.

There is little evidence of gliosis, either cellular or fibrillar, in the sense of the reactive gliosis of adult tissue. In places there is a more dense and compact arrangement of fibrillar masses underneath the cyst lining; if this is reactive gliosis, it is without doubt very old.

The *cerebellum* shows a normal stratification, numerous Purkinje cells, a molecular layer filled with cell processes, and a granular layer in places thin, but as a rule normal. The vessels, particularly in the dentate nucleus, are dilated. Neuroglia tissue is nowhere prominent; there are occasionally a few coarse fibrils along vessels.

The *medulla* shows a well-developed olive and accessory olives in the levels examined. The pyramidal tracts are lacking, or represented by few fibers. There is no gliosis of the ventral regions. There is very little hint of gliosis elsewhere, except along the upper lateral border.

IV. SUMMARY AND REMARKS.

1. An infant, born in the eighth month of pregnancy, one of twins (the other still-born), was backward in development, gave evidence of extensive nervous defect, with numerous convulsive seizures, and died, when thirty-seven months old, of broncho-pneumonia.

2. The autopsy showed gross cerebral changes. The ground plan of the cerebrum was preserved, but the substance of each hemisphere was largely replaced by a closed

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cystic cavity, independent of the ventricles. The interiors of the cystic cavities were traversed by delicate strands of neuroglia tissue. The pyramidal tracts failed to develop. The cerebellum had developed almost normally.

3. The nature and time of the original injury cannot be exactly fixed. The agent was probably focal and just severe enough to destroy the nerve cells or nerve cell producing cells, but leave the neuroglia cell series intact and capable ultimately of producing fibrils. The effect of this differential aplasia is that neuroglia tissue alone serves to maintain much of the ground plan of the cerebral cortex.

4. Although the original injury may have been quite limited in extent, the failure of cell processes and whole fiber systems to develop coördinately with the expansion of the cerebrum has increased the ultimate loss of solid tissue many fold.

5. It is probable that the cystic chambers in the cerebrum are in part due to the dilatation of perivascular spaces, with eventual rending apart of their walls, as the brain plan continues to enlarge and the neuroglia masses contract. There are phagocytic cells in recesses along the fibrous walls of the cystic spaces. It is not clear whether the neuroglia tissue or one of the brain envelopes is the leading tissue in the enlargement of the brain plan.

6. The case showed very little thymus tissue, which was largely overgrown by cells of the connective tissue series. The kidneys were backward in development. There were some peculiarities of the spleen. It is not yet possible to say what part is played herein by the cerebral defect.

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XI.

GASTRIC AND DUODENAL ULCER.

By Edward M. Buckingham, M.D.

The treatment of gastric and duodenal ulcer is of interest at present because of the recent entrance into this field by surgery. My attention has been turned to it by a small number of cases, following each other pretty constantly during several months, and leading to consideration as to what is the real teaching of experience. All my cases together are not enough to tabulate; yet their history teaches certain things that ought not to be ignored, but some of which seem to be forgotten.

Because the diagnosis between gastric and duodenal ulcer is often difficult and is of absolutely no importance, unless the patient is to be subjected to operation, the name peptic ulcer is convenient as covering both varieties. It is asserted with justice that non-operative treatment has not been satisfactory. While this is true, yet it is equally true that it has often been carried out in a half-hearted way. In searching the hospital records, I was struck by the considerable number of cases of hematemesis, occurring in moderately young people a dozen or twenty years ago, and which were discharged well after only a week or ten days. It can hardly be assuming too much to suppose that many of them were really cases of gastric ulcer, that they were insufficiently treated, and that if they had marked symptoms after discharge they went to swell the list of medical failures.

That it is possible to have a series, either of new ulcers or of paroxysms of symptoms in one ulcer with long intervals between paroxysms, and wholly irrespective of treatment, is shown by the case of Mrs. B. This lady, thirty-five years

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old, was seen in consultation with her husband, a physician. For five years there had been occasional epigastric pain. In the last seven weeks pain had followed immediately upon the taking of food, latterly of any kind of food. In these seven weeks, seven rectal hemorrhages had occurred, each hemorrhage being preceded by sharp epigastric pain. The blood had sometimes been red, and the patient dizzy at the time. Examinations of heart, lungs, liver, kidney and rectum were negative. There was tenderness to the right of the epigastrium, but no tumor. Seven years later I saw this lady again. There was then little tenderness and still no tumor. In general there had been little pain, but there had been occasional hemorrhage, once enough to make her faint, and once blood had been vomited. Meanwhile she had been seen by a distinguished physician of the Massachusetts General Hospital, who had agreed with her husband and myself in the diagnosis of ulcer. There had, however, been no treatment, because the patient could never be made to see that the condition warranted the inconvenience of even restricting her diet. Still two years later the husband assured me that his wife was quite well. That ulcers do heal without treatment is abundantly shown by cicatrices found at autopsies where no diagnosis has been made, and even in patients who have had no history of symptoms. It does not follow, then, that when a patient has a return of symptoms after a long time without them that his treatment has been a failure. Our knowledge of the cause of ulcers is imperfect, and it is entirely possible that similar causes may produce a new ulcer long after the original one has healed, for the patient must often return to the old conditions of life. Considerable periods of comfort followed by return of symptoms suggest equally, however, that the particular patient may never have been really well.

The case of Miss S. strongly suggests that there was no real recovery in the weeks before her hemorrhage, but that the symptoms were only in abeyance. This patient, a young adult, had had four years before, gnawing, amounting to distress whenever the stomach was empty, and which was at once relieved by taking milk or other food. About an hour

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after eating, marked pain began in the epigastrium, lasting an hour or an hour and a half. She vomited once or twice, but never blood. Nothing is known as to the treatment, except that it did not include complete rest. This illness lasted for months, but for the next four years she considered herself well. A few weeks before becoming my patient, being then a hospital nurse with good food, but with sufficiently exacting duties, she again broke down. Distress and pain returned about an hour after any amount of food, however small. It is noteworthy as affecting treatment that pain always stopped on lying down. There was vomiting, but never of blood. She was sent to the Convalescent Home for a two weeks' rest and then to duty for four weeks. During this six weeks there were no symptoms. Then she suddenly became faint and went to her room. The next morning she again became suddenly faint, and shortly after vomited five or six ounces of blood. She was ordered absolute rest and nutrient enemata, but was unfortunately allowed cracked ice. In thirty-six hours she began vomiting, and in a short time got rid of sixteen ounces, mostly blood and blood clot. In as short a time as possible she was transferred to a surgical service and gastroenterostomy was done. Some days later, on being allowed a little liquid food, hemorrhage returned in sufficient amount to blanch her. She was then fed solely by enemata and got well. Symptoms had not returned after a year, but she had done no work. This case is introduced here to illustrate long periods of quiescence, one of which occurred in the middle stage of this case. It will be referred to again for its bearing on treatment.

A somewhat similar case is that of Mr. F. This patient was engaged for months in superintending certain factory alterations in a small place where hotel accommodation was bad, the table being especially so. Several times he had severe epigastric pain, sometimes accompanied by vomiting, sometimes by tenderness, and once by chilliness. This pain frequently went into the back, but not always. One paroxysm lasted three weeks. A number of times he was obliged to return home on account of this condition. There

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he got his stomach emptied, generally with oil, and followed it with an opiate. After this he remained pretty quietly in the house for a few days, and while remaining quiet and decently fed he was always free from all discomfort. This freedom from annoyance might last several days after returning to work. Finally, partial rest failed to give relief to pain, and there was a slight hemorrhage while at home. Rest in bed was advised with alimentation solely by the rectum. On the following day he got up for a moment and had immediately a severe hemorrhage and fainted. As soon as possible afterward the stomach was opened and a large, deep ulcer was excised, a special suture being introduced by the surgeon to control hemorrhage.

All these cases, but in different degrees, show the need for continued treatment after apparent convalescence. All point to the need for careful consideration as to the possibility of ulcer when meeting with any disease of the stomach. The first two should teach modesty in claiming good results in any particular case, however treated.

The case T. C. is also one in which either the ulcer was quiescent for a time or in which it originated very rapidly. The first symptoms occurred with the beginning of a fatal hemorrhage.

A boy, five years old, with a good previous history, was admitted to the Children's Hospital on the fourth day of illness with the following history: Onset sudden, with abdominal pain, nausea and diarrhœa. There had been twenty or thirty dejections on the first day, small, and composed of mucus and blood, afterward larger, brighter and foul. It is said that there was tenesmus, but this may have been a misunderstanding. There was certainly pain. The boy was well developed and nourished, but thirsty, restless, apathetic and prostrated. Tongue dry and coated. Throat dry and glazed. Abdomen lax and apparently tender in the *lower* quadrants. Dysentery bacilli not present. Given castor oil and opium. During the first twenty-four hours in the hospital there were twelve dejections, becoming a brighter red, and the sphincter became very lax, perhaps from the

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general condition. Dr. Stone was asked to give a surgical opinion as to the possibility of intussusception. He did not believe it present, and would not operate if he did because of the patient's condition. Adrenalin and gelatin had no effect on the bleeding. A half pint of two per cent. gelatin with thirty minims of 1:1000 adrenalin chloride were given twice. On the eighth day the child died with sudden hemorrhage. Autopsy showed duodenal ulcer. It is a very rare disease in childhood, and I believe that this is the first case ever admitted to the Children's Hospital. It is, also, unfortunately, of interest because the diagnosis was made with certainty only on the autopsy table.

Hour-glass stomachs, adhesions, and imperforate pyloric orifices, with their results, must, of course, be treated by the surgeon or not at all, unless, indeed, the orifice is closed by swelling rather than by contraction or adhesion, a condition of which we could never be sure. With ulcers, however, of which the symptoms are pain, vomiting and hemorrhage, the case is not so plain. Non-operative treatment sometimes succeeds. Operative treatment sometimes fails.

To my mind ulcers having this last set of symptoms ought to be considered as a class by themselves. Their treatment ought to be classified not as surgical or non-surgical, but as excision or rest. The reason for making this distinction is that excision has a distinct aim of its own, while, on the other hand, rectal feeding, regulated diet, drugs or gastroenterostomy all aim at giving rest to the ulcer without removing it. At first sight the idea of excision to get rid of the offending part once for all is beautiful in its simplicity. Surgeons, however, seem at present to prefer gastroenterostomy. Aside from technical difficulty or question of shock, matters that I am not entitled to discuss, it is to be observed that excision does not guarantee against hemorrhage. I do not refer to the possibility of a second ulcer, because the surgeon will probably find that if the patient's condition permits. I mean that after an ulcer has been removed a fatal oozing may continue. The case of Mr. F., referred to above, illustrates this. Three days after excision there was a large, sudden dejection of blood accompanied by great pallor, sigh-

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ing respiration, rapid pulse and cold extremities. From this condition he never rallied. At the autopsy no cause was found for hemorrhage. The stitches were tight and no other ulcer existed. There was a small patch of unsuspected pneumonia in one lung. Other cases of hemorrhage from the mucous membrane, after excision of an ulcer, are to be found in literature. It is fair to say that if the man's loyalty to his employers had not kept him at work as long as it did, it is likely enough that there would have been no post-operative bleeding. It is true, too, that he probably would have bled to death from an eroded vessel in the ulcer if it had not been removed. The point that I am making is that there was hemorrhage after excision of the ulcer, and from no fault of the surgeon.

Aside from excision, and perhaps also from the internal use of hemostatics, all known treatment, and it seems all possible treatment, resolves itself into some way of keeping the ulcer quiet, and at the same time giving nutrition to the patient. Even the use of alkalies to remove acidity, if broadly considered, comes into this class.

It was hoped that gastroenterostomy would allow liquid food to pass through the stomach without exciting peristalsis. Two of my cases are illustrations that this operation cannot be depended on to guard against hemorrhage. The first is the case of Miss S., reported above. Here, at least, it is altogether improbable that the hemorrhage came from a generally inflamed mucous membrane, as in the case of excision, just cited. It seems fairly certain that the patient bled, because the operation, while successful as an operation, failed to affect the stomach as it was intended to do. A second case is that of Miss W., twenty-one years old, a waitress, with incipient phthisis. Menstruation was always scanty and infrequent. Hemoglobin, 90 per cent. Pulse strong. Table habits bad. For two weeks epigastric pain without relation to food. Vomiting after eating. No blood in vomitus. She was put in bed and food given solely by the rectum. Vomiting continued and enemata were badly retained. For two weeks attempts were made to educate the rectum, and with some success, but still not enough was

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taken in this way. When it was supplemented by the mouth vomiting began. Trials were made with large doses of opium and other antispasmodics, with bismuth and with no drugs at all, but without great result. No other cause for vomiting could be discovered, and there was at length a slight hemorrhage. The patient was therefore transferred to a Surgical Service and gastroenterostomy done. She left the table in fair condition. Some hours later a small quantity of blood was spit up, and twice in twenty-four hours she collapsed. In the second collapse she died. Autopsy was not permitted.

The surgeons who did these three operations have kindly allowed me to see their notes. All the operations were urged by me quite as much as by the surgeons that performed them.

All the patients left the operating table in at least fair condition, and I see no reason to suppose that either operation was in the slightest degree responsible for the later hemorrhage. The fatal cases I believe would have died in any case. The point is that gastroenterostomy is no more than excision to be counted on for certain relief. Probably it is less reliable, for there is the chance of direct bleeding from the ulcer as well as that of general oozing.

The most obvious way of securing rest is to put the patient in bed, stop all food by the mouth and give opium. Putting the patient to bed is an important factor. As I have shown, patients suffer more when walking about, and the explanation is evidently found in increased peristalsis. Absolute rest is not compatible with sucking ice for thirst. In this and in other affections melted ice is repeatedly swallowed in sufficient quantity to cause vomiting. Thirst can be relieved partly by wiping the mouth with a wet cloth, partly by giving the daily cleansing enema slowly enough to allow some of it to be absorbed. Feeding must, however, be kept up not merely to support life, but to give sufficient nutrition to heal the ulcer, and the only way is by the rectum. This is an old treatment, but opinion seems to differ as to the extent to which it can be carried out. Some patients cannot, and some patients will not, submit to it as long as others.

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Dr. Sears has pointed out that the rectum can be trained in this respect. The amount of food needed must vary in different cases, and the weight shown by the scales, together with the appearance of the patient, appear to me a better guide than theoretical considerations. My own standard, if I have a standard, is the case of an old man whom I treated in bed for two years on a diet of two quarts of milk per day, given by mouth, without any apparent loss of weight. The indication in his case was want of teeth and senility. Probably a younger person would need a little more food. Opium, which is called for to check peristalsis and secretion, is supposed also to lessen waste. When the rectum rejects its contents it is not necessary to abandon the treatment. It can be omitted or reduced for a day and resumed with a small dose and gradual increase. When the patient cannot live on the amount absorbed from the rectum, we can use that as far as possible, and supplement it by the mouth. Whether the ulcer has healed or not, it is fair to suppose that after a time the stomach has become weakened by disuse if by nothing else, and it seems wise to begin to train it as one does a baby's, only more rapidly.

Published opinions as to the length of time needed for absolute rest differ widely. Remembering that ulcers have apparently existed without symptoms, it seems wise to leave a broad margin of safety and to continue full precautions for a considerable time after apparent recovery. Because of the possibility that apparent recovery may not be real, and knowing that processes of repair depend much on nutrition, it seems wise to push nutrition as far as may be. It is not necessary to leave off rectal feeding because limited mouth feeding has become possible. They can be continued together. Some of the above remarks seem absurdly simple to print, but some experience in reading and in conversation has convinced me that it is not so. The two following cases illustrate much of what has gone before :

Miss A., twenty-four years old, was sick in Sweden with gastric ulcer four years before entering the hospital. In the meantime she had been well. Six weeks before entrance she vomited a half cup of bright blood. From this time she

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commonly vomited three-quarters of an hour after eating. Pain in the side extended into the back. Pain in the epigastrium became so severe after meals that little food was taken. No tenderness, but this quickly appeared. Ordered rest in bed, nothing by mouth. Enemata of peptonized milk eight ounces, one egg, a half ounce of brandy and ten minims of deodorized tincture of opium every six hours. Pain stopped at once and never returned. Enemata retained. Slight tenderness for several days. On the twenty-fifth day there had been two pounds loss of weight, and enemata ceased to be retained. They were therefore reduced to six ounces of the milk with egg, brandy and opium as before, and were given every eight hours instead of every six. Small quantities of peptonized milk were now given by mouth, and the quantity rapidly increased until the patient ceased losing weight. Peptonized milk was preferred because of its supposed rapid absorption, and before beginning it a tumbler of water was allowed, hoping to moisten and clear out the stomach, which had been out of use for over three weeks. As soon as the loss of weight ceased, raw milk in small doses was added with lime water. When increase in weight was sure, this was gradually substituted for peptonized milk by mouth. Next toast was added. Then enemata were gradually increased and the opium in them was as gradually decreased until the fortieth day, when enemata were rejected. They were then omitted, meat was added to the diet and she was allowed to get up. She had regained her weight and was a picture of health, but was retained for another eleven days for observation at light work in the ward. In looking back it is seen that the girl lost two pounds in twenty-five days, her sole food being thirty-two ounces of peptonized milk, four eggs, two ounces of brandy and forty minims of deodorized tincture of opium per day, and what water may have been taken up from the cleansing enemata. It is also seen that while the rectum rejected eight ounces of milk with opium on the twenty-fifth day, it had been trained to retain eleven ounces without opium on the thirty-ninth, the quantity of egg and brandy remaining the same. It is also seen here, as in the case of Mr. F., that tenderness is an inconstant symptom. The same is true of muscular rigidity.

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I should be glad if this history ended here. Unfortunately it does not. She went to unusually hard work as a housemaid, and in about a month began having a pain a half hour after meals, this pain being increased by exercise and relieved by rest. There had been a few small hemorrhages. It was six months after discharge that this was learned, and I do not know her later history. It does not seem likely that gastroenterostomy could have offered her anything more, for it proved possible to give her stomach rest by the plan adopted. In light of the event, and seeing how readily she took to the treatment, and remembering her former history of ulcer, it seems that rest and nutrition should have been pushed longer.

Mrs. S., twenty-four years old, proved a more difficult patient to treat. She was small, always weak, always flatulent, occasionally faints. For three months before entrance, daily vomiting. Pain in epigastrium, and at its left extends into back. Relation to meals not observed, but relieved by vomiting. Tenderness greatest at site of pain. Spasm of left rectus. Blood not seen, but no menstruation for two months, and the patient, habitually regular, was not pregnant. Weight, never over one hundred pounds, had dropped to seventy-one. Prostration marked. Two days after entrance vomited blood. Rest in bed. Peptonized milk eight ounces, one egg, brandy a half ounce, deodorized tincture of opium ten minims, by enema every six hours. Nothing by mouth. The mouth was washed, but complaint of thirst was great. An attempt was made to relieve it and at the same time add to nutrition by the use of one dram of frozen peptonized milk every six hours. It caused vomiting and was withdrawn. A tumbler of hot water was given in hope that a single stirring up of the ulcer would hurt it less than continued petty irritation. It caused purging and was withdrawn. The amount of opium was increased because of pain. As the patient continued to lose weight, milk in the enemata was gradually increased from eight ounces to ten. This amount was used for twelve days, and then the rectum failed. Reduced to six ounces, with a full dose of opium, it was retained. Once enemata were

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obliged to be omitted for a day and were then resumed, two ounces with brandy and opium twice a day, and gradually increased. Always the rectum was used for all it was worth, and the stomach made to supply the deficiency as far as it could. At one time she was getting by mouth one ounce an hour when awake. In a month she had lost ten pounds more; but her appearance was better, pain was less and vomiting after food was less. At the suggestion of Dr. Sears she was given sodium bicarbonate, five grains per hour when needed, and this practically ended the pain. Between the forty-fifth and fifty-seventh days she gained two and a half pounds, and her hæmoglobin went up from sixty to seventy .per cent., the greatest daily amount of food in this time being twenty-four ounces of peptonized milk and six eggs, part of the milk being given by the mouth. There had been no pain for two weeks. Again in two weeks later the milk had been doubled, half by the mouth, and the rectum was taking twenty-four ounces of milk and seven eggs. From this time improvement was steady and she was discharged at her own request four months after entrance.

I regretted this. In view of her history it seemed to me that there was great hope of a brilliant result, but that it was too early, and I so expressed myself at the time.

The after history is that she steadily gained health and soon weighed seven pounds more than she had ever done. Menstruation returned in two months. For a time she was careful as to diet, but then became careless. About a year after discharge pain returned near the cardiac end of the stomach, together with slight tenderness, and in the next two months she vomited a few times. This may mean ulcer or it may mean hyperacidity. This brings her history to date, and as she is not controllable at home, I have recommended her readmission.

This patient was so weak when first seen that I doubt if any surgeon would have cared to do any operation. The apparent situation of ulcer near the cardiac orifice was not especially encouraging for a gastroenterostomy. The case seems to me to offer encouragement for persistence in treating by non-operative rest.

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In summing up this paper I wish to remind readers that it considers only those cases of peptic ulcer that are characterized by pain, vomiting and hemorrhage, without evidence of adhesions or contraction.

The points to which I have tried to call attention are these:

The onset of symptoms may be so sudden that it is impossible to guarantee any human being against death from hemorrhage within a few days.

Patients recover without treatment.

Patients die in spite of any treatment.

A return of symptoms does not of necessity mean the failure of previous treatment.

All treatment is directed to excising the ulcer; or to keeping it at rest, and at the same time feeding the patient.

Hemorrhage may follow any form of treatment, operative or non-operative.

A patient allowed to get up or to suck ice is not undergoing the rest treatment.

Nutrition is of importance as in treating any ulcer.

The rectum can be trained.

Whatever treatment be adopted, its continuance should include a broad margin of safety. This precaution has often been neglected.

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XII.

EIGHT CASES OF EXTREME HEART HYPERTROPHY.

By Samuel T. Orton, M.D.,
Acting Second Assistant in Pathology.
[From the Pathological Laboratory of the Boston City Hospital.]

The present series of subjects having hearts weighing 900 grams or over is formed by eight cases from a total of 2,073 autopsies recorded in the Pathological Laboratory of the Boston City Hospital from 1897 to the present time. The cases have been arranged as far as possible according to cause.

The causes of heart hypertrophy are usually divided into two classes, *i.e.*, the intrinsic and extrinsic, the former consisting of valvular lesions, myocarditis, and aneurysm either of the heart-wall itself or so situated as to cause a relative valvular insufficiency. The extrinsic include pericarditis, especially with adhesions, and any condition tending to maintain a high blood-pressure, such as marked arteriosclerosis or chronic nephritis, obstruction in the pulmonary circulation, etc.

Case 1 of the appended table may be taken as an example of the first type of hypertrophy classified according to causation. This case is apparently one of hypertrophy from *valvular lesions* alone. No pericarditis, no myocarditis, and only very minor grades of nephritis and arteriosclerosis are evident. The patient, a white male adult, gave a history of four attacks of acute articular rheumatism. Three weeks previous to his admission he was taken with a sudden attack of dyspnea and weakness, with cough and bloody expectoration, while at work. One week later edema of the extremities was first noticed, but was slight. On admission he was sinking rapidly, and died on the second day.

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Autopsy revealed very marked lesions of the aortic and mitral valves, namely, chronic endocarditis with insufficiency.

On microscopic examination the heart fibres are seen to be very large. There is a very small amount of perinuclear pigment, but no evident fibrous replacement of muscle bundles. The other organs show nothing of note beyond evidence of chronic passive congestion, except the kidney, which shows a low grade chronic interstitial nephritis.

Under the head of the second of the intrinsic causes, *myocarditis*, may be grouped cases 2, 3 and 4, although all of these cases show more or less nephritis associated.

Case 2 has a less advanced nephritis than either of the other two, and hence may serve better as illustration. This case, a white male, age seventy-one, gives the following history: Patient had always been in the best of health until two years before admission, when he began to suffer with precordial pain and dyspnea on exertion. These attacks were never severe nor prolonged until the time of admission, when he became orthopneic and cyanotic. Edema was very marked and increasing, and the excretion of urine was reduced. Heart area very large. Sounds weak and distant. No murmurs. He remained in this condition until two days before death, when he suffered with a chill, followed by some temperature. At autopsy a heart weighing 965 grams was found, with its valves all normal except for slight irregular thickenings. A small thrombus was found in the right auricle, with three more in the right ventricle and half a dozen more in the left ventricle. Beneath one of these mural thrombi was a softened area of the myocardium, while the wall of the left ventricle showed a depressed fibrous, more or less linear, scar of an old infarct. Much fibrous tissue was evident microscopically in the papillary muscles. The coronary arteries showed moderate sclerosis. Several small infarcts were noted in the lungs, with thrombi in vessels. Arteriosclerosis moderate.

Microscopically the heart showed a very pronounced fibrous myocarditis; large areas were entirely replaced by fibrous tissue, while degenerated muscle bundles only in part replaced pointed to an advancing condition. The unin-

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volved areas showed muscle fibres of very large size, but staining well and showing no pigmentation or vacuolation.

The kidneys are injected, and slight cortical increase of fibrous tissue is evident. There are also some small retention cysts.

Case 3. White male, age 56. No history of antecedent causative factors. Gave up work five years previous to his admission to the hospital on account of weakness and dyspnea. During this period has had more or less mild attacks of failure of compensation. Admitted during a severe attack, which gradually grew worse until his death twenty-three days after admission.

Autopsy showed a marked chronic interstitial nephritis associated with an advanced chronic myocarditis. A depressed linear scar was visible on the interventricular septum in places extending completely through, also several scattered smaller areas of a similar character. Valves normal. Small thrombus in left auricular appendage. Coronaries sclerotic. Kidneys contracted. Capsule adherent. Several old infarcts and one recent one.

Aorta distended and slightly tortuous. Numerous calcified plaques. General arteriosclerosis except in vessels of brain.

Microscopic examination shows marked fibrous replacement of heart muscle. Muscle fibres large and vacuolated.

Kidneys: Recent and old infarcts. Marked growth of fibrous tissue in both cortex and medulla at the expense of kidney substance. Smaller arteries much thickened, especially in the intima.

Liver shows both intra and interlobular connective tissue increase.

Case 4 gives a combination of advanced *arteriosclerosis*, marked chronic *myocarditis*, and moderate thickening of the aortic valve cusps.

White male, age fifty-six. History of rheumatism at twenty-four. First symptoms referable to the heart were noted six months before final admission, consisting of the usual complex accompanying failure of compensation. At this time very marked enlargement of the heart area was noted and a systolic murmur at the base and another at the

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apex. He was relieved and released, but after working one week had another attack of like nature and was readmitted, and gradually sank until his death several months later. The autopsy findings were as follows:

Moderate edema, effusions into peritonèum and pleuræ, and some excess of fluid in pericardium.

Heart 900 grammes. Myocardium firm. Thick white fibrous area 3 by 5 cm. in wall of left ventricle to a depth of 1.5 cm. Diffuse thickening at base of mitral leaflets. Aortic cusps moderately thickened and somewhat curled. Coronaries thickened.

Aorta. — Diffuse thickening and many calcified areas.

Kidneys. — Scar of old infarct filled with fat. Capsule adherent, leaving a mottled granular surface. Many radial opacities in cortex.

Microscopically the heart muscle fibres are seen to be large and granular in appearance, with some vacuolation and numerous areas of fibrous replacement both as a diffuse process and localized to the old infarct scars.

The liver shows early atrophic cirrhosis.

In the kidneys is seen a marked increase of fibrous tissue in the cortex continuous with the capsule. Some increase in the medulla. Some fibroid glomeruli and thickened arterial walls.

Case 5 shows an advanced *nephritis* with only minor changes in the vessels, valves and myocardium. This case, a white male, age forty, had complained of cough with bloody expectoration and some dyspnea amounting only to moderate distress for ten months previous to admission, at which time a very large heart was outlined with an irregular tumultuous rhythm, but no murmurs. Patient failed visibly during the eight weeks following his admission, finally becoming delirious, with general convulsions, coma and death. A mitral systolic murmur was heard late in the course of the illness.

Autopsy showed a heart of 960 grammes, with yellowish areas beneath endocardium, slight thickening of both the aortic and mitral valves, and some atheroma of the coronary vessels.

The kidneys were small, firm, and knobbed with adherent capsules.

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Only slight sclerosis apparent in aorta.

Microscopic examination shows only slight fibrous myocarditis. Muscle fibres large and pale, with some irregular cleavages in the major axis.

Case 6 is an example of hypertrophy from two causes, marked *valvular lesions*, and an *adherent pericardium*.

This case was that of a white male, seventeen years old, giving a history of an attack of acute articular rheumatism at six years of age and again at sixteen. The first symptoms of the heart condition followed the second attack, and the patient was admitted to the hospital, with complete loss of compensation, with orthopnea, edema, etc. Patient was much relieved by treatment, and was released, but was readmitted five months later, suffering from a spontaneous attack of dyspnea. The heart action was tumultuous, and a double murmur was heard over the aortic area, with a rough systolic murmur at the apex. The symptoms grew rapidly worse, and he died on the second day after admission.

Autopsy showed a heart weighing 982 grams. All cusps of the aortic valve curled, flattened and thickened. The pericardium was completely adherent, and was separated with difficulty.

The kidneys gave evidence of chronic congestion, and contained a great deal of fat. The aorta was moderately sclerotic, but bore no calcified plaques.

On microscopic examination the heart fibres show some vacuolation, slight perinuclear pigmentation, and a very few areas giving evidence of fibrous replacement of muscle bun dles. The individual heart muscle fibres are very large.

Case 7 is one of *adhesive pericarditis*, without advanced lesion of the kidneys, vessels or myocardium. An adult negress, very obese, giving a history of an attack in childhood of what was probably acute articular rheumatism. The first symptoms, referable to the heart, followed an attack of influenza one and one-half years before her admission, at which time she had been suffering with an attack of loss of compensation for ten days. Orthopnea and anasarca were marked when she was admitted, and a persistent diarrhea developed and lasted until her death twelve days later.

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Autopsy showed a heart weighing 920 grams. Pericardium completely adherent to heart and pleuræ by old adhesions, with valves all normal. Very slight arteriosclerosis.

Microscopic examination of heart muscle shows a few areas where a slight fibrous replacement has occurred. The kidneys contain a slight excess of fibrous tissue in both cortex and medulla and a few fibroid glomeruli.

Case 8, an Italian, speaking no English. No history obtained. On admission suffering from orthopnea. Cyanotic. Pulse irregular and of high tension. Heart area very large. Cheyne-Stokes respiration. Increasing cyanosis, coma and death on second day.

At autopsy, a heart weighing 900 grams was found containing 700 grams of chicken fat and cruor clots. Valves normal. Myocardium of good color and firm.

Aorta shows a few yellow thickenings. No calcareous plaques.

On microscopic examination the heart muscle fibres are seen to be very large, many bearing perinuclear pigment and showing irregular cleavages in the major axes.

Liver shows very advanced central necroses with pigmentation.

Kidneys injected, but give no evidence of fibrous overgrowth nor other chronic changes.

The accompanying table gives the cases arranged according to cause. The sex and age and body length are given where possible to serve as an index to the size of the body. Then follow the heart weights and measurements of the ventricular walls and valves. The next column, headed "Condition of Valves," deals of course only with organic lesions and not with relative insufficiencies. The next column shows the condition of the pericardium. Under the heading "Myocarditis" is included only the question of fibrous replacement of muscle tissue indicative of chronic myocarditis. The remaining columns explain themselves.

The normal averages are those taken from an article on "Heart Hypertrophy" by Wm. T. Howard, Jr., in the Johns Hopkins Hospital Reports, Vol. III., and are a result of compilation by him of a large series of cases and reports.

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Case.	Sex.	Age.	Body length.	Heart weight in grams.	Left ventricle, thickness of wall.	Right ventricle, thickness of wall.	Tricuspid circumference.	Pulmonary circumference.	Mitral circumference.	Aortic circumference.	Condition of valves.	Condition of pericardium.	Myocarditis.	Edema.	Ascites.	Pleural effusion.	Nephritis.	Arterio-sclerosis.	Autopsy number.
1.	M.	.....	165	950	1.9	0.6	14.	9.	10.	8.	Marked lesions of aortic and mitral.	Normal.	None.	None.	Present.	None.	Chronic interstitial. Slight.	Slight.	03.31
2.	M	71	179	965	2.4	0.5	16.	10.3	12.	9.	Very slight thickening of aortic and mitral.	Effusion 150 c.c.	Very marked.	Very marked.	Present.	Present.	Chronic interstitial. Slight.	Moderate.	05.122
3.	M.	56	167	960	2.	1.	14.	9.	12.5	10.5	Normal.	Slight excess of fluid.	Marked.	Marked.	Present.	Present.	Chronic interstitial. Marked.	Marked.	02.13
4.	M.	56	165	900	2.75	1.	14.	10.	12.5	9.	Moderate thickening of aortic.	Moderate effusion.	Marked.	Marked.	Present.	Present.	Chronic diffuse. Marked.	Marked.	04.22
5.	M.	40	169	960	2.75	1.	13.	10.	13.5	9.	Very slight thickening of aortic and mitral.	Normal.	Slight.	Slight.	Present.	Present.	Chronic diffuse. Marked.	Slight.	02.94
6.	M.	17	165	982	2.	0.6	12.5	8.	10.5	7.5	Marked lesion of aortic. Slight of mitral.	Completely adherent.	Very slight.	Very slight.	Present.	None.	None.	Moderate.	05.126
7.	F.	.....	159	920	2.5	0.7	13.	9.5	9.5	9.	Normal.	Marked adhesions.	Slight.	Marked.	Present.	Present.	Chronic diffuse. Slight.	Slight.	01.142
8.	M.	39	.....	900	.....	.....	15.	8.	13.2	8.5	Normal.	Slight excess of fluid.	Slight.	Marked.	None.	None.	None.	Very slight.	03.106
Normal average,				270	1.2	0.4	10.	6.	9.	6.8									

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XIII.

A SERIES OF CASES OF RENAL SURGERY.

By Francis S. Watson, M.D.

The following series of kidney operations is offered as being representative of the sort of cases of this class that are met with in the course of a general surgical service in such an institution as the Boston City Hospital. The total number of the series is forty-three, to which one other — not operated upon at the hospital — has been added in order to illustrate a certain point in connection with renal surgery. The cases have been classified according to the nature of the operations performed, as follows:

NEPHRECTOMIES.

(12 cases, 4 deaths.)

Abdominal or Combined Lumbo-abdominal Methods.

1. Tubercular disease. (Lumbo-abdominal incision — kidney removed subcapsularly.) Recovery.

2. Hypernephroma. (Same incision employed — capsule removed with kidney.) Recovery.

3, 4 and 5. Traumatic subparietal rupture of the kidney. (One case through an abdominal incision alone, the other two through lumbo-abdominal incisions. The two latter cases had ruptured spleen associated with the kidney injury.) Three deaths.

6. Kidney fixed in abnormal position. (Abdominal incision.) Recovery.

Six cases, three deaths.

Lumbar Nephrectomies.

1. Pyonephrosis. Recovery.

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2 and 3. Ruptured kidneys. Recovery. (Uncomplicated.)

4. Congenital cystic kidney. Recovery.

5. Hydronephrosis. (Death from acute pneumonia on thirteenth day.)

6. Kidney fixed in abnormal position. (Two previous palliative operations.)

Six cases, one death.

PARTIAL NEPHRECTOMY.

1. Tubercular disease. (Upper half of kidney resected.) Recovery.

NEPHROTOMIES.

(10 cases, 2 deaths.)

Hydronephrosis, due to stricture of ureter, 1; 1 death. (Patient was almost moribund at time of operation.)

Pyonephrosis, 1; 1 recovery.

Stone impacted in ureter, 1; 1 recovery.

Exploratory for calculus, 4; 1 death; 3 recoveries.

Ruptured kidney (in one case suture of the kidney wounds was done), 3; no deaths; 3 recoveries.

NEPHRO-LITHOTOMIES.

(7 cases, 7 recoveries.)

In three of the cases in which nephro-lithotomy was done, the presence of the calculus was demonstrated beforehand by X-ray examinations.

Kidney infected in 3 cases prior to operation.

The 10 nephrotomies and the 7 nephro-lithotomies were all performed through lumbar incisions.

NEPHROPEXIES.

(12 cases, no deaths.)

Failures, 1. Time elapsed too short to judge results, 2. Lost sight of, 2.

Cures, 7. The patients in these seven cases have been under observation for various periods of from two to ten years; in none of these cases has there been a return of the symptoms which existed prior to operation.

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All the operations for fixation of the kidney were done through the lumbar incision parallel with the outer border of the quadratus lumborum muscle.

The method of suture employed is one devised by the writer, and is described and illustrated further on in the text in connection with the report of case 8.

DECAPSULATION.

(1 case, 1 recovery.)

CLOSURE OF RENAL FISTULA.

(1 case, 1 recovery.)

(In this case the operation was done after the manner described by Tuffier.)

The mortality of the series is high, being 13 per cent. This is, however, scarcely a fair presentation of this feature of the report. The three fatal cases of ruptured kidney were all complicated by extensive rupture of the spleen, and the patients were all in the most critical condition from shock and excessive hemorrhage. The operations were undertaken only as a desperate resort, and in the faint hope of saving the patients by arresting hemorrhage, which was progressive in each instance.

In the fatal case of hydronephrosis and kidney fixed in an abnormal position, death may be considered to have been accidental. (Acute pneumonia occurring in the course of a perfectly favorable operative convalescence, and beginning on eleventh day.)

In the case of lumbar nephrotomy terminating fatally, in which the operation was performed for the relief of hydronephrosis due to stricture of the ureter, the patient was profoundly uremic and almost moribund, and the operation was done at the urgency of the relatives as the only course which offered even the faintest possibility of saving life.

In the one remaining case in which death occurred, the latter was directly the result of the operative interference, infection of the organ, which took place after an exploratory nephrotomy, being apparently referable to defective aseptic technique, so that altogether there is but one death which can be directly attributed to the operation performed.

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Of the series of forty-four cases, the following present points of sufficient interest to make it worth while to report them somewhat in detail:

Three cases of fixation of the kidney in an abnormal position, by dense adhesions, of such a character as to necessitate nephrectomy in order to relieve the symptoms and dangers brought about by this condition.

1. A man at thirty years, in good health until two years ago, at which time, immediately following recovery from typhoid, he began to have attacks of severe pain in the right side of the abdomen. The pain radiated somewhat in the course of the right ureter, but was chiefly located midway between the tip of the eleventh rib and the anterior superior spine of the ilium. The pain was at first moderate in character during the attacks, but gradually became more severe until the patient, who was absolutely dependent upon his own exertions for a livelihood, became entirely disabled. The pain was spasmodic in character and the duration of the attacks varied a good deal. The onset and cessation of the attacks were sudden. There was no disturbance of function of the digestive or urinary organs in connection with the attacks of pain.

The urine at times contained a deposit of uric acid crystals, but was otherwise normal.

The patient's general condition had not seriously suffered until shortly before he was first examined. During the previous month or so, he said that he was beginning to lose strength.

Soon after the attacks began the patient detected a tumor in the right side of the abdomen below the free border of the ribs, and extending slightly below the level of the umbilicus. He found that he could obtain relief from the pain by pushing upward the tumor, which was freely movable at first.

About six months before his consulting the writer the tumor became fixed low down the right side of the abdomen, and the patient was unable to lift it upward as he had formerly done. Thereafter the attacks of pain became much more severe.

Examination. — A tumor which was immovable, and

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which had the general contour and texture of the kidney, occupied the right side of the abdomen, extending from a point about one inch below the free border of the ribs to about a couple of inches below the level of the umbilicus. In the loin there was a sense of lessened resistance over the area usually occupied by the kidney.

The diagnosis of a right kidney bound down in an abnormal position was made, and operation advised.

Operation. — Abdominal incision through the linea semilunaris over the tumor. The latter was found to be the right kidney. Its condition was as follows:

The organ rested upon the posterior abdominal parietes, upon its outer or convex border, the hilum and renal pelvis being directed forward. It was displaced from its normal position, the lower pole being rather more than three inches below the level of the umbilicus. The renal blood vessels were drawn downward in such a way as to have assumed a more oblique direction than normal, and were somewhat lengthened. An aberrant artery, leaving the renal artery near the aorta, passed horizontally over the surface of the kidney in front, midway between its two ends, occupying a well marked sulcus.

The kidney was firmly adherent to the peritoneum in front and to the lumbar fascia behind. In addition to the adhesions attaching it to these structures, there were three distinct and more or less separate bands of connective tissue — adhesions — which were very dense, and which passed over the anterior surface of the kidney in a horizontal direction, constricting the organ at these points. It was evident that strong pressure must be exerted upon the kidney by these bands whenever the organ should, for any cause, become enlarged.

It was found to be impossible to separate the kidney from the adhesions, or the latter, together with the organ, from the adjacent tissues without tearing the kidney itself. There appeared to be no way of efficiently relieving the condition except by a nephrectomy.

This was accordingly done.

The abdominal wound was closed tight, without drainage, and the patient made an uninterrupted recovery.

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The operation was done February 22, 1898. The patient was under observation, from time to time, during the next three years, throughout which he was in perfectly good health, suffered no inconvenience, and, except during the first three or four months following the operation, when there were frequent and rather large deposits of uric acid crystals, the urine has been of normal character. The daily quantities of the urine during the first week following the operation were as follows: 15, 23, 31, 34, 38, 38, 42 ounces, respectively.

The two other cases did not differ importantly from the one just described. In one instance, however, the kidney had become markedly hydronephrotic, owing to a band of adhesions which crossed the renal pelvis in such a way as to have gradually exercised increasing pressure, and to have prevented the free outflow of the urine.

The difficulty encountered in each of these cases which determined the performance of nephrectomy was that of the excessive density and closeness of the adhesions binding the kidney to adjacent tissues. These were such as to render abortive all efforts at the separation of the organ from either its bed or the adhesions. No expedient, plastic or otherwise, seemed to the writer practical to employ with any probability of success, and he was reluctantly driven to the sacrifice of the organ in each case.

In the second case two attempts were made to relieve the patient by a more palliative operation — division and separation of adhesions. A short period of comparative relief followed each of these attempts, and then the preceding symptoms returned in their original severity. This patient was under observation for sixteen months after the third or final operation — nephrectomy — during which time he was in excellent health and free from all his previous symptoms.

The patient, who died on the thirteenth day following the operation, had had, until the eleventh day, a perfectly smooth course of convalescence. On that day he was attacked by an acute pneumonia of much severity, to which he succumbed a little less than three days later.

Case No. 4. — Laceration of the right kindey due to mus-

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cular effort. The kidney was probably already hydronephrotic. Infection of the injured organ and pyonephrosis occurred four weeks after the accident. Lumbar nephrectomy one week later. Recovery.

This patient was a stout and, so far as she knew, a perfectly healthy woman previous to the accident which produced the injury of the kidney. Five weeks before the operation was done she was washing a window. She made a quick movement to reach the top of it, in order to draw down the upper sash, stretching both arms high above her head and pulling down hard in lowering the sash. On doing this she experienced a violent pain in the region of the right kidney, became faint and presently vomited. The second passage of urine following the accident contained a moderate quantity of blood, and a slight hematuria persisted during the next two days.

Vomiting and faintness soon passed off, and the pain grew less. On the third day she was up and about again, but kept quiet because of a sense of discomfort and tenderness in the right renal region. Three weeks later this became more marked, and her attending physician then discovered a tumor in the region of the right kidney and extending forward into the right side of the abdomen. The swelling increased during the next week, and at the same time she began to have a slight rise in temperature, and for the first time pus appeared in the urine.

Operation. — June 2, 1903. Fifth week after receipt of the injury. The patient's condition had by the end of the fifth week, at which time the writer was first asked to see her, become serious. The temperature was 103°, tongue heavily coated, and she presented the symptoms of a septic infection of some gravity.

The whole right side of the abdomen was occupied by a large tumor which apparently represented the much distended kidney. There was marked tenderness over the site of this swelling.

The right kidney was exposed by the lumbar incision parallel with the outer border of the quadratus lumborum muscle, and subsequently enlarged by the addition of a

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second cut parallel with the lower border of the twelfth rib. The organ was found to be sacculated and greatly distended by pus and urine. The anterior surface of the kidney was firmly adherent to the overlying peritoneum, the upper pole to the lower surface of the diaphragm, and posteriorly adhesions of less density attached the organ to the lumbar fascia. The upper end of the ureter was also adherent to the surface of the tumor.

The distended kidney was emptied of its contents by a trochar. The adhesions were separated except in front, over which part of the organ the thickened, fibrous capsule of the kidney was freed from it, and left attached to the peritoneum. The kidney was then easily drawn out upon the loin and removed. It was found to have been lacerated, the wound passing transversely through its convex border. (See Fig. 1.) The convalescence was somewhat long, but uninterrupted, and the patient made a perfect recovery.

This case is one of about a dozen that have been reported in which the kidney has been lacerated by muscular effort, which in some instances appears to have been entirely inadequate to produce the condition; thus in Voit's case, which is perhaps the most curious of all, a woman's kidney was lacerated by the pressure of her husband's arm, grasping her about the waist forcibly while waltzing with her. In this instance, also, infection occurred at the site of injury, a pyonephrosis and perinephritic abscess resulted, and a lumbar nephrotomy revealed the fact that the kidney had been torn as in the writer's case, just reported above.

In still another case, laceration of the kidney, with fatal result, was produced by muscular effort made by a man in delivering a blow at his opponent while boxing.

Campbell reports the case of a young girl who ruptured her kidney by the sharp bending of the body forward and to one side, which she made in jumping over a hedge.

The above citations will serve as examples of the others, of this manner of producing the serious injury.

Case No. 5. — Another example of laceration of the kidney, the points of interest being the production of the condition by a blow inflicted upon the anterior abdominal wall, and the

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fact that the laceration did not extend through the fibrous capsule. In consequence of the latter the blood was confined within the kidney and its pelvis, except for a moderate

FIG. 1. Rupture of a previously hydronephrotic kidney by muscular action alone: Infection following the accident: Lumbar nephrectomy fifth week: Recovery.

quantity which escaped beneath the capsule, separating the latter from a considerable part of the surface of the kidney.

Cases Nos. 6 and 7. — These cases are examples of the excessive hemorrahge that occurs in connection with some cases of lacerated kidney, especially such as are associated with the

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injury of an intraperitoneal organ, the latter being the spleen in these two instances. In both, not only was the entire retroperitoneal space in the loin, from diaphragm to pelvis, distended with blood, but the abdomen was also filled with it

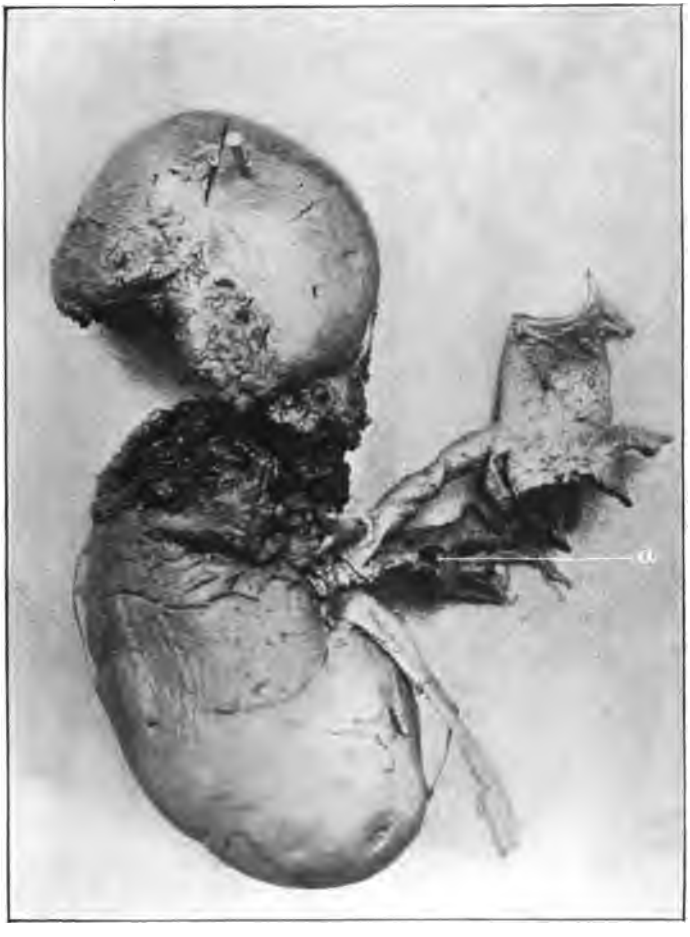

FIG. 2. Subparietal rupture of the kidney; laceration of renal vein; (a) shows the rent in the renal vein: Associated injuries were laceration of peritoneum overlying kidney, and extensive laceration of spleen: Abdominal nephrectomy: Death.

from extensive lacerations of the spleen. In one case the renal vein was torn, in the other a branch of the renal artery. (Figures 2 and 3 show the kidneys in these two cases.) Abdominal nephrectomy and arrest of hemorrhage failed to

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save either patient; and one of them died of shock fourteen hours after the operation, and the other three days after the nephrectomy. In the latter case the patient had rallied from shock in a large measure, but succumbed in consequence of

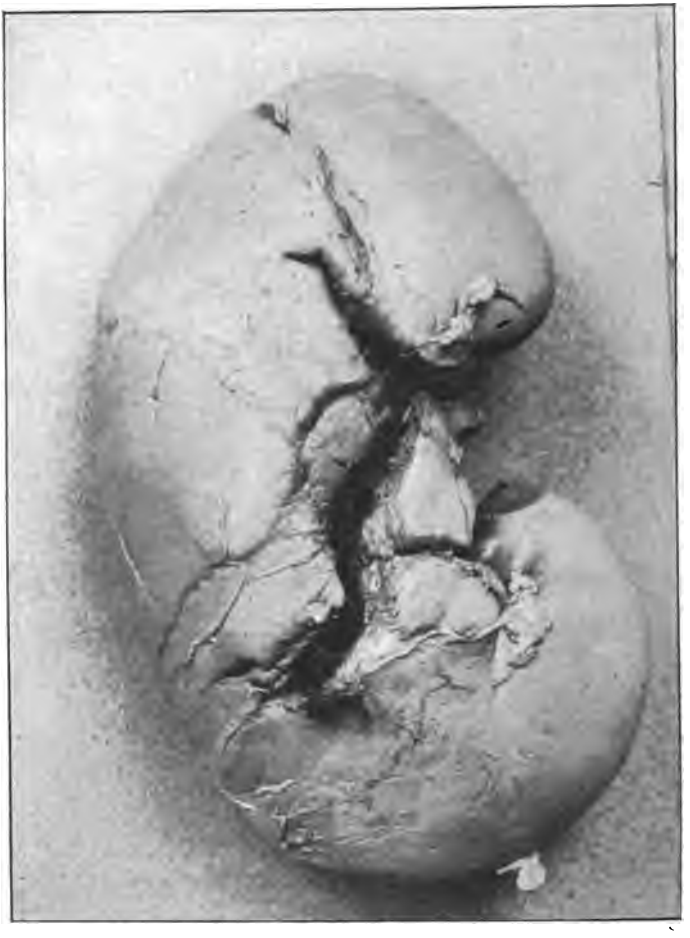

FIG. 3. Subparietal rupture of the kidney; laceration of branch of renal artery, and laceration of spleen: Abdominal nephrectomy: Death.

the excessive hemorrhage which had occurred previously, and to a beginning septic peritonitis.

In connection with these cases of lacerated kidney with associated intraperitoneal injuries, it may be noted that when there is but a single intraperitoneal organ involved together

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with the injury of the kidney, it is always on the same side with the latter; thus the spleen or descending colon may be involved in injuries of the left kidney; the liver or ascending colon, if the right kidney is the one injured, but not the liver with the left kidney, or the spleen with the right one. The writer found no instance in which this rule was not true in an analysis of 116 cases of subparietal laceration of the kidney with associated injuries, of which 84 involved intraperitoneal organs. The 116 cases with associated injuries formed a part of a series of 603, the remaining 487 being uncomplicated by injuries of other organs.*

Case 8 is that of a movable kidney for which nephropexy was performed successfully. The point of interest in connection with it is that it illustrates the evils of a previously and improperly performed operation which the writer had the unusual opportunity of seeing.

The patient had been operated upon about six months before by another surgeon for the relief of symptoms due to movable kidney. No benefit resulted from this operation. On the contrary, the patient's condition was worse. The kidney was found to be enlarged when examined by the writer at the end of this time.

Upon exposing the organ by a lumbar incision it was seen that the sutures which had been placed to attach the kidney, at the previous operation, had been passed through the lower part only of it. The upper end of the kidney was not fixed, and upon placing the patient in an upright position the upper pole was seen to fall forward, producing as it did so a constriction of the upper end of the ureter.

Upon fixing the kidney properly by sutures which passed through the middle and upper third of the organ, in the manner illustrated in the accompanying cut, the symptoms were entirely relieved. This patient was under observation for one year subsequently, during which time she remained in perfect health.

In connection with this case the writer takes occasion to describe again a method of suturing movable kidney, which

* Published in Boston Medical and Surgical Journal, Vol. CXLIX., No. 2, p. 29, July 9, 1903. *Et seq.* July 16, 1903, p. 64.

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he devised in 1894, and has employed with satisfactory results since that time.

The kidney is exposed through the usual lumbar incision, parallel with the outer border of the quadratus lumburum;

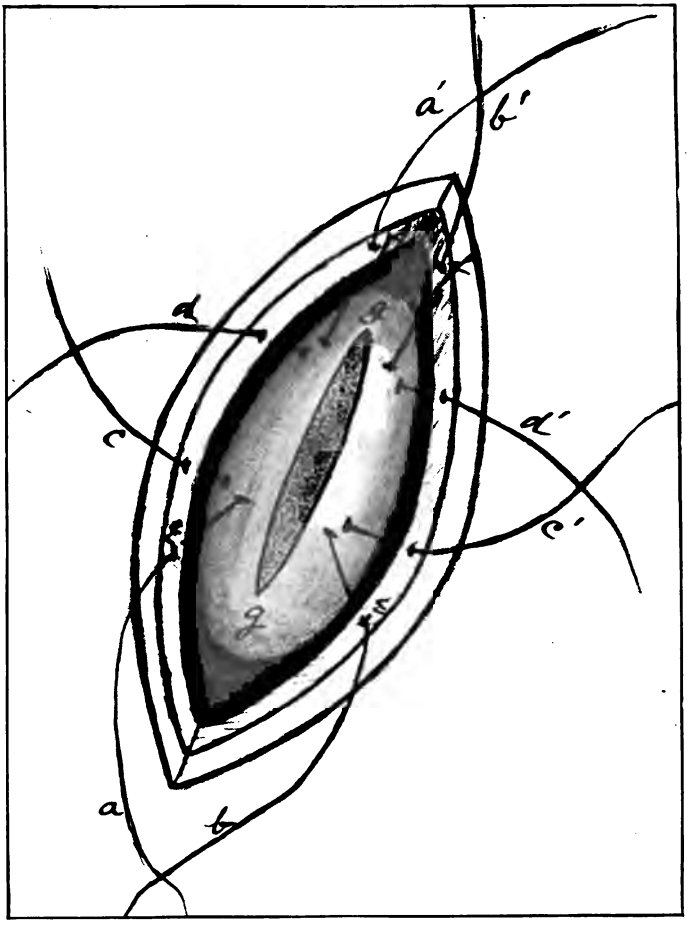

FIG 4. Watson's method of applying suture for fixation of "movable kidney."

it is then isolated from its fatty envelope and most of the latter is removed. The kidney is then drawn out upon the loin.

Four sutures — No. 2 chromicized catgut — each threaded on a needle of a special form, shown in the diagram, are passed as follows: The first two a–a^1 and b–b^1 lie in the

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direction of the long axis of the kidney, one on either side of the convex border and about an inch apart. They are entered through the inner muscle and fascia layers on either side of the *lower* end of the lumbar incision at the points e and e; they are then carried to the outer surface of the kidney, which they enter a little below the junction of its middle and lower thirds, thence are carried beneath the fibrous capsule and through the kidney substance, about one quarter of an inch beneath the surface of the organ, and emerge somewhat above the junction of the middle and upper thirds of the kidney. From these points they are carried through the inner muscle and the fascia layers on either side the *upper* end f–f of the lumbar incision. The two upper and two lower ends of these sutures respectively are temporarily held in catch forceps.

The third and fourth sutures c to c^1 and d to d^1 are next passed in a similar manner, but in a direction at right angles to that in which the first two were placed. Each of the horizontal threads enters the kidney substance a little outside of the points of entrance and exit of one of the longitudinal sutures, is carried through the kidney substance — a little nearer the surface of the organ than the first two stitches — and emerges just outside the points of entrance and exit of the first two sutures. In this way the transverse threads lie across and above the course of the longitudinal ones, the intention of so placing them being to have them form an obstacle to the tearing of the latter through the kidney substance should they tend to do so. The upper and lower ends of the longitudinal stitches and the ends of the transverse ones on either side the lumbar incision are now drawn taut simultaneously. When this is done it will be found that the convex border of the kidney is drawn to a level of the inner surface of the lumbar wound. It is retained in this position by tying the ends of each pair of sutures together, thus: The lower ends of the longitudinal ones are first tied one to the other a to b. The upper ends of the same sutures are now tied to each other in the same way a^1 to b^1. Next the same is done with the ends of each of the transverse sutures c to d and c^1 to d^1.

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Just before the sutures are tied in this way, a longitudinal incision is made through the fibrous capsule of the convex border of the kidney from g to g, and the capsule is freed from the kidney for a very little distance on either side; the lumbar wound is then closed without drainage.

Case No. 9. — This patient was not operated upon at the hospital, but the case is included for the sake of showing the benefits which sometimes, at any rate, may attend permanent drainage of the kidneys through the loin, and that this condition is quite compatible with health and entire comfort of the patient.

J. B., aged forty. In 1894 suffered an acute ascending infection of the left kidney, and at the same time a partial closure of the left ureter. An acute pyonephrosis resulted. The patient's condition was critical. Lumbar nephrostomy was done, a large quantity of foul pus and urine was evacuated from the greatly distended organ, and the interior of the latter was cleansed. The ureter at that time was apparently occluded by a constriction low down in its course, through which no instrument could be passed. Convalescence was rapid and uninterrupted. Permanent drainage was arranged by means of a soft rubber catheter passed through a hard rubber plate and discharging the urine into a flat bottle worn upon the loin and attached to a belt passing around the body.

Eight years later the right kidney also became infected. The patient's condition was less serious, and the kidney less injured than the left one had been previous to operation. A nephrostomy was performed upon the second kidney by my colleague, Dr. Paul Thorndike, the patient again making an excellent recovery. Permanent drainage, arranged in the same manner as that of the other kidney, was instituted after the second operation also.

This patient, therefore, has worn an apparatus for the drainage through the loin of one of his kidneys for eleven years, and during the last three of them he has done so for the other kidney as well. Except for the short time during which he was ill, previous to the second operation, and for one or two slight indispositions, he has remained in perfectly

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good health throughout the entire time, and has suffered neither pain nor discomfort. He has been actively at work in his business all the while, and no one but himself is aware of his condition.

The writer is of the opinion that an equally favorable result and the same comfort to the patient is attainable if the individual be intelligent and living under conditions in which he is able to properly care for himself, and that permanent lumbar drainage of the kidney is by no means the unmitigated evil under such circumstances that it seems to be considered by some surgeons; furthermore, he believes this procedure to offer the best chance of saving life and securing the health of the patient in certain cases in which a nephrectomy would involve a far greater risk, and in which transplantation of the ureter, no matter how it be carried out, incurs a greater danger and involves much more discomfort and distress for the patient.

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XIV.

A STUDY OF THE GASTRIC CONTENTS IN TWENTY-ONE CASES OF TABES, IN THREE CASES DURING GASTRIC CRISES.

By M. P. Smithwick, M.D.

Various theories have been advanced to explain the production of gastric crises, in some the origin being central and in others peripheral. According to Sahli [1] the crisis or a good number of its phenomena are dependent upon hypersecretion with hyperacidity. Similar conclusions have been reached by other observers.[2] The acidity in reported cases seems to follow no fixed rule. Ewald,[3] in 37 cases of gastric crises, found hyperacidity in 9, normal acidity in 9 and hypacidity in 19. In one case during a crisis HCl. was absent.

Following is a report of analysis of stomach contents in twenty-one cases of tabes. Three cases had gastric crises, and in these analyses were made during attacks. The activity of secretory and motor functions in the different analyses is shown in tabular form. In estimating the amount of pepsin, 25 c.c. of filtered gastric contents was made normally acid with HCl. and kept at 30° to 40° C. until it had digested 0.05 gram of coagulated egg albumin. As most of these were cases in the neurological out-patient department, the unsatisfactory method of estimating the motor function by the amount of contents one hour after an Ewald test meal was resorted to. In every instance the contents were removed through a stomach tube with a very compressible bulb by siphonage compression and aspiration, no vomitus being in-

1. H. Sahli Correspondenzb. f. Schweizer Aerzte, 1885.
2. Maladies intrinsèques de la moelle epinière. Traite de Medicine. Tome IX., 1904.
3. P. Marie. Centralbl. f. d. gesammt. Therapie. Oct., 1904.

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cluded. After removal of contents successive measured amounts of water were introduced and measured on removal to determine the exact amount of contents.

W. J. G., male, forty-two years of age. Referred for examination by Dr. W. B. Bancroft, June, 1900. Well until two years before above date, except for pneumonia in boyhood, grip six years ago, and gonorrhea six times. Denies syphilis. 1896 had "rheumatic" pains in calves of legs one month. Exposed to venereal infection since fifteen years old. January, 1898, had severe epigastric pain, with vomiting after supper of corned shoulder. Morphia was given by his physician. At first attacks would yield to one-fourth grain morphia subcutaneously, and the interval was two weeks or longer. Now requires one-half or two-thirds grain. Food has no influence. Attacks usually come before breakfast, epigastric pain, nausea, vomiting. Never any food in vomitus of a morning attack. During month preceding my examination called the physician thirteen times for a subcut. No digestive symptoms between crises except constipation.

Examination. — Left pupil dilated, right small; neither react to light and both to distance. No paralysis ex. oc. muscles. No areas of anesthesia found. Knee jerks absent. No Romberg. Distinct circular scar on glans penis. (Patient has noticed it since his eighteenth year, but is ignorant of the cause.) Stomach gently inflated, is normally situated and extends to bottom of umbilicus, showing moderate enlargement. No tumor felt before or after inflation. Physical examination otherwise negative.

First Test, June 23, 1900. — No food since previous evening. At 5.45 A.M. gastric crisis began. At 7.20 A.M., while pain was intense, I gave one-half grain morphia subcut., and at 10 A.M., after cessation of pain, gave bread 30 gm., water 300 c.c. One hour later removed 280 c.c. brownish contents with odor of vinegar and rancid. Acid to litmus.

Free HCl. absent. (Phloroglucin-Vanillin.)

Total acidity, .109 per cent. (Phenolphtalein.)

Blood pigment, absent. (Webber. Müller.)

Combined HCl., absent. (Ewald-Sjovist.)

Acetic acid, recognized by odor.

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Butyric acid, present.

Biuret, absent.

Lactic, intense reaction. (DeLong.)

Second Test, July 9, 1900. — Had eaten freely of meat and vegetables for some days preceding this examination, the last meal being at 4.45 P.M., July 8. At 7 A.M., introduced and removed, successively, several measured amounts of water, finding stomach practically empty. Washings were acid to litmus; no food macroscopically. Free HCl. absent. (Phloroglucin-Vanillin and tropæolin.) Microscope showed occasional striated muscle fiber and connective tissue. No blood. Considerable squamous epithelium and frequently polynuclear leucocyte, and occasionally a salivary corpuscle. One hour after, bread 30 gm., water 300 c.c., removed 30 c.c.+, stomach not emptied completely. Contents acid to litmus.

Free HCl. present. (Phloroglucin-Vanillin) .05 per cent. (Töpfer's reagent and tropæolin.)

Total acidity, .22 per cent.

Filtrate, dextrin (IKI.).

The patient died of pneumonia, in this hospital, December 14, 1902, on the service of Dr. Henry Jackson, and the autopsy by Drs. Roberts and Southard confirmed the diagnosis of tabes. The autopsy records place the lower limit of the stomach four cm. below umbilicus, the wall rather thin, but healthy; and contain the following description of the spinal cord: Envelopes normal. No increase of subdural fluid. On sections cervical and dorsal regions appear normal. The posterior columns of the lumbar region show small, irregular, greyish-white areas .5— 1 mm. in diameter. Again in places, small, darker areas are seen in each column, irregular in contour, about the size of the head of a pin. The dorsal horns appear set in from the lateral fissure and bend towards each other.

D. C. (History from patient and from his wife.) Seen February 19, 1899, at Boston City Hospital, in clinic of Dr. H. D. Arnold.

Syphilis, 1887. Internal treatment begun one year later and continued one year. Ptosis left upper eyelid, 1897, four

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months. Diplopia then and at times since. Also pain in left eye at times. Pain in knees occasionally; walks as well in dark as in light. Married, 1888. Three healthy children. First had rash at six months, while teething. Wife has not miscarried and is healthy. She says coitus averaged two or three times a night the first two years of married life. After that one or two times. The month before our examination desire had apparently ceased.

Well, until October, 1895, when during supper severe pain began, referred to lower ribs and then to epigastrium. Pain and vomiting lasted all night and for two weeks, except when morphia was given. After complete relief for six months, pain returned for one week and again after five months' relief. Pain is chiefly in epigastrium, with chilly feelings and vomiting. May come several times daily. It often came immediately after eating, but might come at any time, even after a day's fast. Has not ceased longer than two or three weeks at a time the past year. At times pain will not yield to less than two grains of morphia subcut. No stomach trouble between crises.

We had reported that the analyses of gastric contents would not explain the attacks of pain before Dr. Arnold examined patient. Dr. Knapp confirmed his diagnosis of tabes.

First Test.— (Some hours after a crisis relieved by morphia grain 1 subcut.) 10 A.M., February 4, 1899. One hour after, bread, one ounce; water, ten ounces; removed 12½ ounces contents of olive green color and slimy. Free HCl. .028 per cent. Töpfer's reagent and tropæolin.

Combined HCl. .073 per cent. Yeast increased. No blood or sarcinæ.

Organic acids and acid salts .014 per cent. fungus present; total acidity, .113 per cent. Succinic acid present.

Twenty-five c.c. of filtrate + gtt. iv dilute HCl. + .05 gram coag. egg albumin nearly digested in three hours at 37.5 C.

Second Test. — February 8 (some hours after crisis, relieved by two 1-grain subcuts. morphia), in morning. (No food since previous evening.) After removing from stomach 50 c.c. slimy green fluid, gave bread, 30; water, 300, and in one

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hour removed 50 c.c. contents showing following test: Free HCl. (Phloroglucin-Vanillin, Töpfer's reagent, tropæolin) .07 per cent. Total acidity, .19 per cent.

Third Test. — No crisis for twenty-four hours, and no food for twelve hours. Emptied stomach and gave bread, 30; water, 300, and after one hour removed 30 c.c. +. Free HCl. (Phloroglucin-Vanillin and Töpfer's reagent), .09 per cent. Total acidity, .20 per cent.

Fourth Test. — (Five hours after crisis.) Crisis at 7 A.M. relieved by morphia. Piece of bread and glass of water at noon, and removed two hours later. Amount, 420 c.c., faintly acid to litmus.

Free HCl. absent. (Phloroglucin-Vanillin. Tropæolin and Töpfer's reagent gave yellow, and congo-red paper gave no reaction.

Biuret reaction, present.

Lactic acid, present. (Kelling and DeJong.)

Fifth Test. — (During crisis.) February 21. Before giving test-meal (Ewald), removed from stomach greenish fluid (fungus), acid to litmus. Free HCl. absent. One hour after, bread, 30 gm.; water, 300 c.c., contents acid to litmus, showed:

Free HCl. absent. (Phloroglucin-Vanillin. Töpfer's reagent, tropæolin.)

Total acidity (Phenolphtalein), .07 per cent.

Filtrate showed dextrine (IKI.).

Biuret, present. Succinic acid present.

Microscopic, no blood, no sarcinæ.

Sixth Test. — (Not during crisis.) February 24. Amount contents 1½ hours after, bread, 30 grams; water, 300 c.c., 60 c.c.

Free HCl. (Phloroglucin-Vanillin, Töpfer's reagent, tropæolin), .058 per cent.

Combined HCl. (Alizarin), .043 per cent.

Organic acids and acid salts, .050 per cent.

Total acidity, .153 per cent.

Seventh Test. — (During crisis.) February 26. At 4 A.M. emptied fasting stomach of 2½ ounces golden yellow fluid, and introduced measured amount of water and recovered

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the same. This fluid was acid to litmus. Free HCl. absent. (Phloroglucin-Vanillin, Töpfer's reagent, tropæolin.) No color with congo paper. Gave bread, 30 grams; water, 300 c.c., and after one hour, during which the intense pain had continued, removed six ounces. Acid to litmus.

Free HCl. absent. (Phloroglucin-Vanillin, Töpfer's reagent, tropæolin.) No color with congo-red paper.

Biuret, present.

Total acidity (Phenalphtalein), .038 per cent.

Filtrate gave achroödextrin (IKI.).

C. H. P., male, clerk, thirty-two years of age at examination, November, 1898. Gonorrhea 1886. No history of syphilis. Since June, 1897, subject to severe, repeated attacks of painless nausea, and vomiting of one or several days' duration. The amount of vomitus was very large. Has been treated in several hospitals and by many physicians in this country and in Europe. Between attacks no digestive symptoms usually, except constipation. Bowels move every week-day, but patient considers them very sluggish. Says attacks always terminate when free catharsis is induced. Regulation of diet failed to prevent attacks, but regulation of bowels in this, and in one of the other two gastric crisis cases, seemed to act as a partial preventive. Treatment of the attacks was ineffective.

Examination. — Tall and poorly nourished. Pupils equal, react to distance, but scarcely at all to light. No nystagmus. Knee jerks present, but much diminished. No Romberg. No special ataxia. Tactile and painful sensation much diminished over a zone to left of lower end of sternum. No bladder symptoms. No tremor or speech disturbance. Moderate ptosis or enlargement of stomach. Fecal masses in ascending colon. Urine normal. In March, 1899, this patient was referred to Dr. J. J. Thomas to determine if these attacks were tabetic crises, as I suspected. Dr. Thomas was inclined to consider it tabes.

In August, 1905, talked with patient in street car and watched him alight. No speech disturbance or tremor. There was ataxic gait and ptosis of one eyelid. In March, 1899, Dr. Alexander Quackenboss found the fundi normal.

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One half dioptre of hypermetropic astigmatism in right eye, and one dioptre in left. 6° Esophoria. Glasses did not influence attacks.

Examination. — November 10, 1898. In morning, without food or drink since previous evening. One hour after, bread, 30 grams; water, 300 c.c.; removed 35 c.c.; contents not remarkable in appearance.

Free HCl. (Phloroglucin-Vanillin) .12 per cent.

Total acidity, .23 per cent.

Examination. — December 15, 1898. Patient had had anorexia three days and had a crisis nine days later. One and one-fourth hours after, bread, 30 grams; water, 300 c.c.; removed 120 c.c. contents.

Free HCl. (Töpfer's reagent and tropæolin) .12 per cent.

Total acidity, .27 per cent.

Microscopic examination of sediment showed no blood or anything abnormal.

Examination. — December 27 (third day of crisis). Patient had been drinking water and vomiting three days. One and one-half hours after, bread, 30 grams; water, 300 c.c.; removed 415 c.c.; rather slimy contents.

Free HCl. (Phloroglucin-Vanillin) .029 per cent.

Total acidity, .09 per cent.

No blood or sarcinæ in sediment.

CONCLUSIONS.

1. In tabes gastric motor power and HCl. and pepsin secretion are depressed more commonly than exalted.

2. No degree of activity of these functions characterizes tabetics.

3. In gastric crises of this series HCl. secretion and motor power were more depressed than usual, and in the severe painful crises depression of acid secretion was extreme and continued for hours. In one case (C. H. P.) there was probably hypersecretion of gastric juice.

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	Hyperchlorhydria, .2 per cent.+	Euchlorhydria, .1—.2 per cent.	Hypochlorhydria, —.1 per cent.	Anachlorhydria.	Pepsin normal, 8¼ hours or—	Pepsin diminished, 8¼ hours.+	Hypermotility.	Normal motility, less than 75 c.c.	Hypomotility, 75 c.c.+	Hyperacidity, total .30 per cent.+	Normal acidity, .2—.3 per cent.	Hyperacidity, total (less than .20 per cent).	Succinic acid.	Lactic acid.	Number of tests.
M. J.	2				1	1		1	1	2			1		2
C. A. E.		1	1			1		2			2			2	2
W. L.			2		1			2			2				2
L. H.		2	2	2		2		1	1			2		1	2
L. C.			3			2			2		2	1			2
S. J. W.			1	3		2			3		3	1			3
J. J. C.					1			1	1						1
G. F. C.		1			1						1				1
W. F.	1	1				2		1			2				2
W. H. S.		1									1				1
J. J. B.		2	1			1					3				3
M. R.			3	3		2		2	1			2			3
W. H. A.			2			1		1			1	1			2
A. D.			1												1
P. S.		1		2				1			1		1		1
G. L.			2	2					2				1		2
J. L.			2	1								2	2		2
W. J. G.			1					1	3		1	4	7	2	2
D. C.			7		1			4	1		1				1
C. H. P.		2	1					1			2				3
Mrs. M.		1						1			1				1
Totals	3	12	29	8	5	14	.....	19	16	2	23	12	13	5	45

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XV.

A CASE ILLUSTRATING THE VALUE OF PERSISTENT CONSERVATISM IN THE TREATMENT OF UNUNITED FRACTURES OF THE LOWER LEG.

EXTENSIVE LOSS OF BONE AND SOFT PARTS IN BOTH LEGS; REPEATED OPERATIONS; BONY UNION ABOUT THREE YEARS AFTER THE ORIGINAL INJURY; RESTORATION OF FUNCTION SOMEWHAT LATER.

By George H. Monks, M.D.

T. M., a single man, twenty-eight years old, an iron-cutter by trade, was admitted to the First Surgical Service of the hospital April 6, 1900.* He had been injured while breaking up for a junk-shop an old iron tank which had formerly contained chemicals. The tank exploded while he was engaged in this work, and he was severely injured in both legs. He had also a few other injuries less serious in character.

The patient was a large, strong and well developed man. Though suffering from considerable shock he was quite conscious, and his pulse was of good volume and strength.

On the front of the *right leg*, about four inches below the tubercle of the tibia, there was a large wound, in which could be seen an extensive comminution of the tibia. At about the same level there was also a compound comminuted fracture of the fibula. The foot was warm, and the anterior tibial and dorsalis pedis arteries pulsated.

On the *left leg* there was a compound comminuted fracture of tibia and fibula, opening into a large wound about five

*This case, when admitted, came under the care of Dr. M. F. Gavin, by whose courtesy I report it. With the rotation of services, however, the man ultimately came under the charge of the other surgeons on the First Surgical Service (Dr. H. L. Burrell and myself).

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FIG. 1. Showing, from the front, both legs of the patient in a standing position. The lower legs (from knees to ankles) are shorter by about two inches than they were before the accident.

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inches long on the anterior aspect of the leg. The fracture of the tibia was on about the same level as the fractures on the right leg, but the fracture of the fibula was nearly four inches farther down the shaft.

Strips of cloth had been tied about both legs as tourniquets. When these were removed there was slight hemorrhage.

The patient was etherized, and, both wounds having been cleansed and rendered as aseptic as possible, Drs. Gavin and Lothrop removed the unattached fragments of bone, after which the remaining fragments were sutured together with silver wire. The loss of substance, both of soft parts and of bone, was extensive. The wounds were partially closed and drained. A plaster bandage was applied to both legs, from the toes to a point above the knees. Convalescence was uneventful, though no union took place between the fragments. About four months after the operation some sinuses in both legs, which had persisted since the operation, were explored, and pieces of silver wire and bits of necrosed bone were removed. From this time on, for over a year (in the course of which the patient had an attack of erysipelas), repeated efforts — operative and otherwise — were made by Dr. Gavin, Dr. Burrell and myself to secure bony union, and at times it seemed as if the fragments were beginning to unite, but after fourteen months there was still mobility between the fragments in both legs.

On June 20, 1901, I resected the ends of the fragments of the tibia and fibula of the *right leg*, cutting them squarely across, but saving as much of the periosteum as possible. When this was done there was an interval of more than an inch between the upper and lower fragments. These were brought together by silver wire sutures, two for the tibia and one for the fibula. Eight days later I did a similar operation on the bones of the *left leg*. After each operation a plaster of Paris bandage was applied to the leg operated upon.

Eight days after the last operation the wounds in both legs appeared to have healed by first intention. The temperature was normal, there had been little or no pain, and

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FIG. 2. Showing the patient balancing himself on his right foot. The muscles of this leg have evidently contracted sufficiently to enable him to keep his equilibrium for an indefinite period.

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the general condition of the patient was excellent. Eight days later a stitch-hole abscess appeared in the left leg. About a month after the operation the patient was put into a wheel chair. There was still slight mobility in both legs. From this time until the patient left the hospital (about eight months) various expedients were employed to secure union, but at the time he left the hospital (March 29, 1902) some mobility was still evident in both legs. After leaving the hospital (which he did at his own request) he made frequent visits to the Surgical Out-Patient Department. At this time he was using crutches.

On May 29, 1902, he was readmitted to the hospital and carefully examined. A certain amount of mobility was still present in both legs, and the question of a double amputation was discussed.

It was finally decided to fit a Thomas knee splint to one leg and a leather splint to the other, and he was advised to wear the splints, and to use the legs as much as possible, for at least another year.

He left the hospital again about two weeks after his readmission, and went to Nova Scotia, where he remained for a long time.

On April 27, 1905, he was again admitted to the hospital for removal of a piece of wire, the end of which protruded through a small sinus leading to one of the old fractures on the left leg. He reported that after leaving the hospital the wounds suppurated a good deal, but that after a time the bones united. He said that he had walked on his legs for the previous eighteen months, though freely only for the last six months. Ether was administered and the wire was easily removed. The patient was discharged from the hospital a day or two afterward.

He says that in the autumn of 1903 he began to walk without crutches, and his ability to do so increased from day to day. He writes that during the following winter he sawed for household purposes twenty cords of hard wood and about five cords of soft; that in the spring of 1904 he worked three months as janitor of a large office building and attended the boiler for heating purposes, working fifteen

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FIG. 3. Showing the patient balancing himself on his left foot. The man could easily support his weight on this foot, but he could balance himself in this position for only a moment. It was, therefore, found necessary to steady him somewhat while this photograph (by time exposure) was being taken. The raising of the patient's second toe is suggestive of his effort to maintain his equilibrium.

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hours a day; that during the following summer he did little else than odd jobs, but from September until January he was janitor of two large office buildings, also taking care of a boiler. His working hours at this time were seventeen hours a day, including Sundays.

FIG. 4. An X-ray photograph, showing the united fractures in the shafts of both bones of both legs. In the right tibia there are two wire sutures, in the right fibula one, and in the left tibia one. There is some displacement of the fragments of the left fibula, but there is good bony union between them.

A few months later he came into the hospital at my request and photographs and radiographs were taken, from which the accompanying illustrations were made. (See Figs. 1, 2, 3 and 4.) He walked with only a slight limp, and in other respects appeared like an able-bodied man. There was still

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one small sinus on the left leg from which a very slight discharge took place.

The man is now preparing himself for the purpose of becoming an automobile chauffeur.

Remarks. — This case is reported for the purpose of showing:

1. That union is possible in ununited fractures of the shafts of the bones of the lower leg after very long periods of time. In this case union took place about two years after resection of the ends of the fragments, and about three years after the original injury.

2. That, even in cases where the bones are considerably shortened (it was estimated that the shortening in this case was about two inches), the muscles will contract sufficiently to enable the patient to balance himself upon the injured leg.

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XVI.

CHORIO-EPITHELIOMA IN A PREGNANT UTERUS — RUPTURE OF UTERUS — ACUTE HEMORRHAGE.

BY ERNEST B. YOUNG, M.D.

The following case of chorio-epithelioma malignum, occurring with pregnancy in progress and attended by rupture of the uterus and severe hemorrhage, simulating the rupture of an ectopic gestation, is reported owing to its rarity, even though incomplete.

REPORT OF CASE.

History. — Mary Waters, twenty-three years, married, entered the Boston City Hospital on December 25, 1904, suffering from what appeared to be a ruptured extrauterine pregnancy, and such was the diagnosis made at the time of operation.

She had always enjoyed good health. Three years previous, there had been an accidental miscarriage at three months, and one year later she was delivered at full term. The convalescence from both pregnancies had been uneventful.

In September, 1904, the catamenia appeared for the last time, and there were symptoms of pregnancy.

During October she suffered sharp attacks of pain in the left lower abdomen from time to time, which lasted a few hours and then disappeared. There was no vomiting during these attacks, and the patient lay in bed or on a lounge until they gradually passed away. Three weeks before entrance there was a similar attack, although between October and the first week in December she had been free from them. On Christmas morning she was seized with severe pain

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throughout the abdomen, felt faint and began vomiting, which continued until sent to the hospital by her physician. The pain was most severe in the left lower quadrant.

Physical Examination. — Well developed and nourished woman, showing signs of shock and acute hemorrhage. Temperature subnormal, pulse weak and rapid. Heart and lungs negative. Abdomen slightly distended and rigid, with signs of free fluid in the peritoneal cavity. Vagina slightly blue, but normal, uterus enlarged, cervix soft, and resistance felt in the vaginal vault. Leucocyte count 32,000, hemoglobin 45 per cent.

I operated as soon as the patient could be prepared, and found the abdomen filled with free blood to such an extent that it ran out over the towels from the incision. The lower flanks and pelvis were filled with laminated clots of various ages, showing that repeated hemorrhages had taken place. Those in the pelvis were the oldest, the hemorrhages from which they arose having evidently taken place some days previously. None of them was organized.

After the blood and clots had been partially cleared away, a rupture was found in a dome-like mass projecting from the fundus of the uterus. In attempting to raise the uterus, a small fetus of about three months popped out from the rent and the inside of the mass appeared to be lined with the fetal membranes. It was at first thought to be a rupture of the uterine end of the tube, but on inserting the finger and removing the membranes, the cornu was felt to be intact. As the patient could bear no prolonged operation, an elliptical incision was made and the ragged mass excised. To bring the wall together, it was necessary to sacrifice the left tube. Nothing abnormal was recognized in the feel of the uterus. The uterine wound was closed with catgut sutures which reached to the mucosa, and included the whole muscular wall.

The abdomen was closed without drainage, after irrigation with salt solution. Aided by stimulation and subcutaneous infusions of saline solution, the patient rallied and made a good recovery; but during the time which elapsed, while waiting for the pathological report, a bloody, rather foul

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vaginal discharge was present and the temperature varied from 99 to 101°.

The excised portion showed the process in the uterine wall to be chorio-epithelioma malignum, and it was decided to perform a complete hysterectomy.

On January 4, 1905, this procedure was carried out by the combined method with every aseptic precaution. The wound in the uterus was found to be quite firmly healed, with a portion of the sigmoid flexure slightly adherent to the scar. The temperature began to rise on the day before operation, and on January 7 there were two chills, the temperature rising to 105.2°. These continued daily.

On January 8 some pus was found in the abdominal wound and the vaginal gauze was foul. As soon as drainage was established, the patient seemed to improve; but after about ten days commenced to fail rapidly, and died on January 18, very suddenly. No metastases could be made out in any part of the body by physical examination. Urinary analysis showed only a slight hyperemia.

Although there was infection of the abdominal wound, it seems probable that metastases were already formed elsewhere in the body, as while apparently recovering from the infection the anemia was progressive and the cachexia constantly increased.

Unfortunately, owing to a misunderstanding, no autopsy could be obtained.

I am indebted to Dr. F. B. Mallory of the Pathological Department for the appended report of the specimen submitted to him for examination, and also for the micro-photographs. The drawing shows the condition found on opening the abdomen at the first operation, except that the uterus is slightly smaller owing to the removal of the fetus and membranes.

PATHOLOGICAL REPORT. BY DR. F. B. MALLORY.

S—05.937. Specimen received in alcohol. It consists of two parts, a fetus and a portion of the fundus of the uterus.

The fetus is well formed, and measures 9 cm. in length. Histological examination shows the tissues well preserved.

The portion of the uterus received measures 5.5 cm. in width, 3.5 cm.

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in thickness, and 5 cm. in length. It has attached to it, on one side, the left oviduct, which is of normal size and appearance.

Projecting from the inside of the specimen at the lower end is a ragged mass composed of chorionic villi enclosing the fetal membranes. Along the upper surface of the uterus, running diagonally from before backwards, is a ragged rent 5.7 cm. long, and 2 to 3 cm. in width, from which project chorionic villi, blood clot, the umbilical cord and the torn edge of the fetal membranes. The wall of the uterus surrounding this rent thins out to nothing. One end of the rent comes to within 1 cm. of the proximal end of the oviduct.

In the uterine wall 1.5 cm. distant from the rent, and 5 cm. from the oviduct, is a thin-walled, bulging area, measuring 2.2 by 3 cm. On section the wall over this area is as thin as paper and lined within with a laminated clot 7 mm. in thickness.

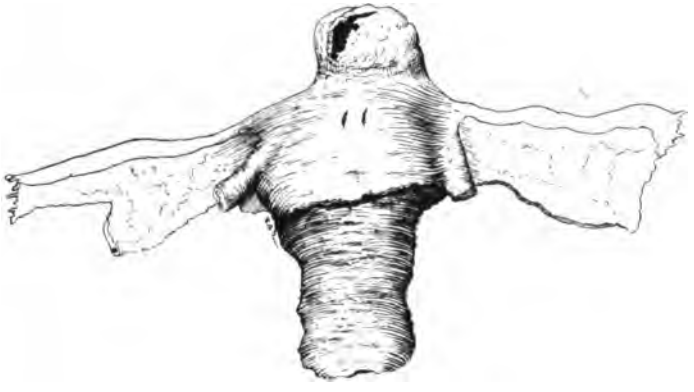

FIG. 1. Appearance of uterus at first operation after expulsion of fetus. Drawn from the specimen after removal.

At the lower end of the specimen the uterine wall measures a little less than 1 cm. in its thickest part, and grows rapidly thin as it approaches the rent and the thin-walled bulging area.

Histological examination of sections prepared from various parts of the specimen, particularly where the wall is thickest, shows a condition which is not easy to explain. Many of the arteries, both large and small, are filled with large cells which completely occlude the lumina. Some of these cells contain a large lobulated nucleus, others contain multiple nuclei (6–12 or more in number). In some of the vessels the cells lie free within the lumen, but in others they are situated in part, at least, beneath the lining endothelium, and may even form a part of the inner wall of the vessel. Cytoplasm of these large cells is often vacuolated, suggesting the presence of fat droplets. The tissue surrounding most of these arteries appears perfectly normal. In one section an artery is thrombosed, and contains both masses of fibrin and large cells like those described. In another section an artery is thrombosed, but contains only fibrin. In both cases some organization of the fibrin has begun.

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The inner edge of the sections, corresponding to the lumen of the uterus, shows numerous chorionic villi, some of which are embedded in blood clot and have undergone necrosis. In a few areas small masses of typical decidual cells are present. For the most part, however, the chorionic villi come in direct contact with the smooth muscle tissue, or with the walls of large veins. At the end of one villus the syncytial cells are turned back and the cells of the layer of Langerhans, greatly increased in number (trophoblasts of Minot?), have penetrated through the muscle tissue into a large vein and are streaming out into its lumen. In other places similar cells are extending from the ends of villi into the muscle tissue and spreading through it in rows and clumps in all directions, so that in places they suggest in consequence of their alveolar arrangement the picture of a carcinoma. In the thin parts of the uterine wall, these cells extend almost to the peritoneal surface.

The walls of many of the large veins contain large cells which closely resemble those found in the arteries, but it is only occasionally that any of these large cells are found free within the lumen of any one of them. Similar cells occur to some extent in the connective tissue and also in muscle tissue. On account of the presence of the masses of large cells in the arteries a diagnosis of malignancy was made and extirpation of the entire uterus advised. The description of the specimen received is as follows:

S—05.937. Specimen consists of uterus with the oviduct and ovary on the right side, and the ovary on the left. The left oviduct has been removed. Along the upper border of the uterus is a sutured incised wound extending from a little beyond the middle point of the uterus out to the ovary. The right oviduct, ovary and a portion of broad ligament with it is swollen and edematous. The left ovary and a small amount of tissue connected with it is likewise edematous. Both ovaries have a number of small cysts, especially the left. The uterus measures 10.5 cm. from the fundus to the cervix. Its greatest breadth is 7.5 cm. Its greatest thickness 3 cm. The sutured wound along the upper left border of the uterus already referred to is bulging in the lower part, and grayish tissue projects more or less from it. Cervix swollen, sutured. On opening up the uterus, the cervix is moderately dilated and filled with a soft reddish clot. The fundus contains a soft, light reddish gray polypoid mass 4.3 cm. long, 1.3 wide, from 3 to 5 mm. thick, which is attached to the upper end of the uterus. The uterine wall is grayish and rather opaque in color. On section through the incised portion of the fundus of the uterus there is found yellowish gray somewhat granular tissue through which the sutures are largely placed. This tissue is 7 mm. in depth and 12 mm. in width. Towards the middle line of the uterus this curious grayish tissue becomes 12 mm. in depth and 8 mm. in width. In the middle line of the fundus this tissue extends clear through the wall of the uterus, and the soft mass within the uterus is seen to be attached at its base to it. In the left ovary is a small corpus hemorrhagicum.

Microscopic examinations of numerous sections through all parts of the uterus, but especially in the region of the first operation, failed to show any large cells corresponding to those found in the arteries in the

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first specimen. The reddish gray mass within the uterus consists of blood clot containing the remains of necrotic chorionic villi. Along the line of the suture there is considerable necrosis and muscle tissue, with moderate wideness of repair.

Remarks. — There seems to be but two probable explanations of the appearance described in this case. One is that the rupture was due to (a) a malignant growth invading and weakening the uterine wall. The tumor might be metastatic from somewhere else in the body. Against this explanation is the fact that the cells within the arteries show no evidence of extension into the surrounding tissue. Or the tumor might

FIG. 2. Section of uterus (low power).

be primary within the uterus, an atypical chorionepithelioma. This was the view at first entertained. Against this interpretation is the size of the cells within the arteries. They are much larger than the cells of the layer of Langerhans, which have been described as extending into the uterine tissue from the ends of some of the villi. The cells within the arteries resemble more closely the decidual cells.

When all things are taken into consideration the more reasonable explanation seems to be that the rupture was due to (b) a cornual or interstitial pregnancy, and that the lesions present are due entirely to an increase of normal functions under abnormal conditions. On this theory the large cells in the walls of the veins, in the connective and

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muscle tissues, and within the arteries, would represent new-formed decidual cells. A similar formation of decidual cells in the walls of veins is present to some extent in the mucous membrane in normal pregnancy. The penetration of villi into the muscle tissue is perfectly analagous to the normal process of growth into the uterine mucosa, but the extension of the cells of the layer of Langerhans into the adjoining tissues is probably in excess of the normal condition. It is only fair to say that embryologists who have studied the sections think that a tumor origin for the large cells in the arteries is a more reasonable explanation.

FIG. 3. Section of uterus (high power).

This case seems well worth publishing, in spite of the fact that it is incomplete, owing to the lack of post-mortem examination, because it calls attention to the necessity of careful histological study of cases of interstitial pregnancy. It is possible, also, that cases of tubal pregnancy might also throw some light on the unusual lesions present in this case.

The interesting clinical points in the case reported are the long time elapsing since the previous pregnancy and the presence of the growth with pregnancy in progress.

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The question naturally arises as to whether the growth started from the fetal cells of the final pregnancy or whether some remaining tissues from the previous pregnancy were fanned into life. The question might also be considered as to whether the rupture was due to the thinning of the diseased uterine wall by the cells of the chorion during the processes of implantation of the ovum, for we know that such a process exists (Minot). The examination of the specimen made it apparent that the latter must be answered in the negative, and that rupture was due to the stretching and thinning of the affected portion of the uterine wall by the increase in size of the fetal envelope. The former question, unfortunately, cannot be answered.

As there is some difference in opinion among those who have examined the specimen, it is to be regretted that no post-mortem examination could be obtained, as this might have cleared some of the questions which remain obscure.

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XVII.

TUBERCULOSIS AND RELATED DISEASES OF THE LUNGS IN THE MEDICAL OUT-PATIENT DEPARTMENT.

By W. H. Robey, Jr., M.D., and R. C. Larrabee, M.D.

Any one who has ever served in the out-patient department of a large hospital must have been harassed by doubts as to how much good he has been able to do to patients with tuberculosis of the lungs. He must have compared his results as to both diagnosis and treatment with those obtained in his private practice, and the comparison could only be unfavorable to the out-patient department. If he is conscientious he must have asked himself how matters might be improved. The papers which follow represent the efforts of two members of the out-patient staff, working independently and using material from different services, to answer these questions.

DIAGNOSIS AND GENERAL CONSIDERATIONS.

By Ralph C. Larrabee, M.D.

During the months of June, July and August, 1905, fifty-nine cases of tuberculosis of the lungs were treated on the male side of the Medical Out-Patient Department. Of these fifty-five were new cases. This is $7\frac{3}{10}$ per cent. of the total number of new cases treated. In the corresponding months of 1904 $6\frac{5}{10}$ per cent. of all new cases applying for treatment had tuberculosis of the lungs.

Of the total fifty-nine cases, twenty-two were classed as early or incipient, nineteen as well-marked, and eighteen as advanced. Few, even among the advanced cases, knew, before coming to the hospital, what they were suffering from.

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Apparently the public, or at least that part of it that frequents the hospital, is not yet awake to the importance of an early diagnosis in chronic coughs, and of the early treatment of consumption. It is also true that a surprisingly large number of physicians still pursue the mistaken policy of concealing from the consumptive the nature of his trouble.

Seven of the fifty-nine cases came to us on account of hemorrhages from the lungs. There were four cases complicated by well-marked tuberculosis of the larynx, one by pleuritic effusion, and one by tubercular peritonitis. Six cases had coincident non-tubercular diseases.

It is perhaps worth while to mention the unusual frequency of dry pleurisy during the latter part of the summer. Up to July 11 but eight cases of this condition were treated. In the next seven days seventeen cases were seen. The total for the three months was forty-three. Ten cases of pleurisy with effusion were also seen, these being scattered in their occurrence. By way of comparison it was found that in the corresponding months of the previous summer there were but seven cases of dry pleurisy and nine of pleurisy with effusion. Five of the seven "dry" cases occurred during three successive days. On comparing the dates of these cases with the meteorological records of the two summers it was at once evident that the greater number occurred during the periods of extreme hot weather. This was true only of the "dry" cases. Those with demonstrable effusion were about equally numerous in the two seasons and did not appear to depend at all upon climatic influences.

Remembering the recognized frequency with which pleurisy with effusion is the result of tuberculosis, the question arose as to whether the same were true of these cases of dry pleurisy. Some effort was made to solve this problem by the use of tuberculin and the fluoroscope, but the cases were too few and the results too doubtful to be of value. Clinically these mild pleurisies occurring in hot weather appear to belong in a different class from the ordinary sero-fibrinous ones. They are probably not tubercular in origin.

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The diagnosis of tuberculosis in the fifty-nine cases herein reported was based on the physical signs, the presence of the tubercle bacillus in the sputum, examination with the fluoroscope and the tuberculin reaction. Physical examination of the chest showed signs which were at least suggestive in all cases but one. In this one the lungs were negative on several careful examinations, but the history was suggestive and bacilli were present. Tubercle bacilli were sought in every case where the sputum could be obtained, usually at the first visit. The results were positive in seventy-eight per cent. Bacilli were found in eighty-eight per cent. of the early cases, in sixty-nine per cent. of the well-marked and in seventy-nine per cent. of the advanced. The fact that they were present in such a large proportion of the early cases is probably due to our reluctance to accept a case as tuberculosis with very slight or doubtful signs if it lacked this proof. This conservativeness may have caused us to overlook an occasional incipient case. One must be more conservative in the diagnosis of tuberculosis among the poor than among the rich. If a well-to-do individual is sent to California for the winter because of a suspicious cough, which later turns out to be of innocent origin, no particular harm is done. But it is a serious matter in a poor family to take the principal wage earner from his work and send him to a sanatorium, perhaps at the expense of his savings of years, with the result also of making him more or less an outcast. If the diagnosis is proved there can be no doubt that he should be urged to take the most vigorous measures and to take them early. But if the diagnosis is really doubtful it is better to go a little slower and be sure.

The X-ray and tuberculin were used only on a few doubtful cases. The fluoroscope gives valuable information, especially in excluding negative cases, but great care must be exercised in interpreting positive findings. Thus, in this series three cases showed a shadow in one side of the chest, with limited excursion of the diaphragm, but none of the three reacted to five milligrammes of tuberculin. In one the signs were due in all probability to fibrinous pleurisy, in one

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to emphysema and slight broncho-pneumonia, and in one to chronic influenza.

Tuberculin was employed in the following manner: The patient was given a thermometer and instructed to put it in his mouth for five minutes every two hours, to avoid shaking it, and to return to the clinic in two days. If the maximum temperature was found to be normal five milligrammes of tuberculin were given subcutaneously, and the patient was told to continue the use of the thermometer for forty-eight hours more. The results were not very definite. Several cases were clearly negative. None were clearly positive. For example, one man returned with a maximum temperature of 100° and a severe pharyngitis. Whether the symptoms were due to the pharyngitis or to the tuberculin it was impossible to say.

The following case deserves especial mention. A Russian Jew, fifty-eight years old, complained of cough and pain in the back of four weeks' duration. There were numerous fine, crackling râles in the right apex. The fluoroscope showed a shadow in the right apex with limited excursion of the diaphragm on the same side. Tubercle bacilli were twice absent and the tuberculin reaction was negative. For three weeks his condition remained about the same. The sputum was then sent to the pathological department, which reported "An organism resembling the bacillus of influenza in morphology and staining reactions found."

As regards diagnosis, the Out-Patient Department is in a position to do work of great value to the community. As regards treatment after the diagnosis is made, it must always be far behind the sanatorium. During the three months' service herein described these facts were constantly borne in mind, and as soon as the diagnosis of tuberculosis was made, efforts were at once begun to place the patient in an appropriate institution, or under some other form of permanent treatment, with due regard to the peculiar circumstances of the individual. In the first place, six patients came to the hospital with hemorrhages or other complications calling for immediate, temporary recumbency. These were recommended to the wards. Four were accepted and

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two rejected by the admitting physician. Two patients were referred to their family physicians, and two were still under observation at the end of the service. Twelve either refused to accept the advice given or disappeared from observation after the first or second visit. The remaining thirty-seven were recommended to some institution or to some form of permanent treatment.

The results of the efforts to place these thirty-seven cases were rather discouraging. For only a few could the State Sanatorium at Rutland be considered — some were too far advanced, most could not afford even the small price charged; only rarely did a patient refuse on other grounds. Eight patients in all were recommended. Only three ultimately got there, and one of these is soon to be discharged as an unfavorable case. As for the Long Island Hospital, many were unwilling to go; others were willing, but lacked the necessary Boston settlement. Of seventeen cases recommended, but three — all well marked or advanced — reached the institution. Several of the cases who failed of admission to Long Island were recommended to Tewksbury by the Registration Department, and, in all, seven of our cases reached the latter institution — all well marked or advanced. Seven were recommended to the Summer Hospital of the Association for the Relief and Control of Tuberculosis on Parker Hill. Six of these — all who applied — were accepted, and great credit is due the Association for its liberal policy. As this institution is only a temporary one for the summer months, and as the patients sleep at home, these cases cannot be considered permanently placed. One man was sent to a sanatorium in the West, one was sent to the country, while only one was kept under treatment as an out-patient.

These results are surely discouraging, particulary when we find that of the twenty-two cases classed as "early" — cases in which permanent arrest of the disease seemed possible — only three could be placed under conditions giving the best outlook for such a result. One conclusion is sufficiently obvious — that, so long as sanatorium accommodations are as inadequate as at present, many consumptives of the poorer class will get their only care in an out-patient

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clinic. It is important, therefore, to consider the subject of ambulatory treatment.

AMBULATORY TREATMENT.

By William H. Robey, Jr., M.D.

Eleven years ago I first saw pulmonary tuberculosis treated in the Out-Patient Department of the hospital. I felt then that it was a hopeless condition as viewed from the out-patient clinic. Since that time there has undoubtedly been some improvement, but the question is, How much has the Out-Patient Department alone been responsible for the change? More or less medicine was given at that time to each patient as a routine, with a slip containing the following directions:

1. Consumption is a contagious disease, but the breath of consumptives is not directly infectious.
2. The seeds of the disease are found in the phlegm or spittle which is coughed up, but it is not a source of danger till it has become dry.
3. Do not, therefore, spit upon the streets or upon the floor of your house or shop.
4. Indoors use a special spit-cup, which either contains water or is lined with paper. The cup must be often emptied into the pan of the water-closet, or into a bright fire — never anywhere else — and then washed out with boiling water.
5. Outdoors, use a bit of rag or paper, which should be burned as soon as possible.
6. Handkerchiefs should never be used for the phlegm; if used at all, they should be boiled for half an hour.
7. Keep your room clean; use a damp cloth for dusting.
8. Throw the windows wide open when you leave the room; at night, sleep with the window somewhat open from the top.
9. Consumptive patients should sleep alone.
10. Consumptive mothers should not nurse their children.

After a time this slip was given up, or at least distributed only occasionally, as the staff felt that the advice was not followed.

At present the method pursued by the out-patient staff is nearly uniform.

The case is carefully examined and the advice given according to the extent of the process. The weight and temperature are taken and the patient's environment is carefully studied. If the case is one of incipient phthisis with

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little or no reaction, and we can from history and physical examination feel fairly certain of our diagnosis, we recommend the patient to a sanatorium at once, but it is better in general, where the circumstances will allow, to study the temperature, weight and physical signs for two or three weeks to be sure that the case is not advancing too fast to make sanatorium treatment of little use. Some patients will keep about through a pneumonia and present themselves at the Out-Patient Department in a state of resolution. I saw a delicate looking young woman in the out-patient clinic with all the physical signs at the right apex and a history suggestive of phthisis, but without sputum. I thought she had incipient phthisis, but contrary to my usual custom I did not tell her or her friend, but requested her to come again in five days. She came, and her chest was entirely clear. We have to consider this possibility before making a positive diagnosis or sending to a sanatorium.

Except in certain cases the patient is told of his condition, especially if he is alone. The importance of this is twice as great in an out-patient clinic as in private practice. If accompanied by a friend the full seriousness of the condition is strongly pictured to him. The patient may not come again, and before he seeks advice elsewhere he may do great harm to himself and friends, if the true condition is not told him.

We point out to the patient and his friends the contagiousness of phthisis, and by strongly emphasizing it we gain in some instances three points. We impress or try to impress the patient with the importance of personal cleanliness; we engender in the family a fear of infection, and by so doing we secure their co-operation in the patient's cleanliness; we may, to the patient's advantage, secure a residence in a sanatorium because the relatives fear to keep him at home and so are moved to secure the means for his maintenance.

By cleanliness we mean the care of his body and clothing, keeping the moustache and beard short and the fingers free from sputum when using the spit-cup. We urge them to protect their friends by not kissing them, by having separate dishes which shall be treated with boiling water after using,

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and by the careful use of the spit-cup or small rags which can be burned.

If the physical condition allows and the patient's means are sufficient, we urge sanatorium treatment. If every case could be trained in a sanatorium, even for a short time, the subsequent care and treatment at home would be much more profitable. Every phthisis patient who learns how to live in a sanatorium and returns to the community makes the work with others just that much easier. Every patient who has had friends or relatives who have slept through the winter in rooms with the windows wide open is more willing to believe in our advice.

If the patient's financial condition will not permit him to leave home, then we instruct him how to live there. The environment is considered, and the patient urged to better it if possible. A few of my cases have had friends in the interior of the State, some conducting small farms, and have been advised to go to them. The patient is told to be out in the air as much as possible, to sit well covered up in the sunshine, and not to omit this part of the treatment because he does not feel as well one day as another. This absolute rest applies particularly to the cases accompanied by fever. He is told to sleep in a room by himself, to have the windows wide open in winter and summer, and to make himself comfortable in bed with sufficient covering.

A diet list is given suggesting plain, simple food without beer or liquors. Ordinarily the patient is advised to drink a quart of good milk daily and to take a raw egg after each meal.

About a year ago the out-patient staff made out the following directions, a copy of which is given to persons with diseases of the lungs:

FRIENDLY ADVICE TO PERSONS HAVING DISEASES OF THE LUNGS.

Although you may have trouble in your lungs, and be suffering from the disease called tuberculosis, you may get well, as thousands of others have done, by strict adherence to the following rules:

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Be out in the fresh air as much as possible. If you cannot have work out of doors, go to the house door or to an open window, and take twelve full breaths. Do this six times each day. Do not work in a dusty place. Get in the sunshine as often as you can. Sleep in a clean, well-aired room, with windows open, and go to bed early. Avoid crowded rooms where the air is close, and where there is much smoking. Eat plain, simple food (eggs, meat, bread, oatmeal, macaroni, rice, vegetables, milk, cream and butter). If possible, have some hot liquid food before you get up in the morning and at bedtime.

Spend your money for good food rather than for medicines. Do not drink whiskey, rum, gin, brandy or beer. Keep clean.

Take a sponge bath each morning. Rub the skin well with a coarse towel.

Do not swallow what you cough up. Protect your friends and neighbors from taking this disease from you by burning what you cough up or by throwing it down the water-closet. What you cough up contains the germs of the disease, and if it dries it soon becomes dust and flies about in the air, and your friends, breathing this dust, are liable to catch your disease. Never spit upon the floor or in the street.

Do not spit into your handkerchief, but use a spit-cup or have small pieces of cloth or soft paper to spit into. Do not put them into your pocket, but collect them in a paper bag, and burn bag and all when you get a chance.

Try not to cough. When you must cough, hold a piece of cloth in front of your mouth, so that particles shall not fly out into the room. Do not sleep with another person. Have your knives, forks and spoons washed with boiling water. Hankerchiefs should be boiled for half an hour before washing.

Recently medicines have been given only to correct certain symptoms.

In hopeless cases with considerable cough and sputum the patients have been advised, largely for the sake of their families, especially where there was great poverty, to go to Tewksbury or the Long Island Hospital, and a few have availed themselves of the opportunity.

In two consecutive services within twelve months, one in the summer (1904) and one in the spring (1905), I saw 43 new cases in which the diagnosis of phthisis was made either from the physical signs and history or with the addition of tubercle bacilli in the sputum. There were also 9 cases of pleurisy and 12 of pleurisy with effusion. Each patient was given the directions necessary in his case. The visits made by each individual to the hospital were as follows: Two came 9 times, one came 6 times, five 4 times, eight 3 times, twenty twice, and twenty-seven once.

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We personally visited these cases, and 31 could not be located. Some that could not be found were thought to be living and apparently in good health. Six of the pleurisy with effusion cases were admitted to the hospital. Seven of the phthisis patients went to Tewksbury or Long Island. Three cases were known to have died at their homes. In only two cases were the full directions of the hospital carried out in detail, and in one, which was well advanced, apparently no particular had been omitted. Several had large well-aired rooms. One man had a large room with three windows always open, but slept with his grandson. One patient was fairly well and able to do light work as long as his wife lived, after which he broke down through insufficient nourishment and had to go to Long Island.

There is evidence that many try to follow the hospital directions as nearly as their means and intelligence will permit. One thing is clear, the Out-Patient Department must do more to observe its cases of pulmonary disease; to make sure that patients understand the directions and that they do their best to follow them. Perhaps the time will come when the majority of tuberculous patients may be taught how to live by a residence in a local sanatorium. A short time after the first visit patients with tuberculosis should be sent for, and if they do not respond should be looked up by the visiting physician or his house-officer. Every effort should be made to learn how patients live. The nurses of the Boston Association for the Relief and Control of Tuberculosis are doing an excellent work in this respect, but they should not be expected to relieve the out-patient physician of his responsibility.

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XVIII.

STONE IN THE URETER. REPORT OF A CASE.

By Joshua C. Hubbard, M.D.

F. S., male, a resident of Boston, forty-eight years old, single, entered the hospital July 7, 1905. He was born in Sweden. His family and previous histories were both unimportant. For two days previous to his entrance he had had pain in the right side of the abdomen extending to the back. The pain tended to shoot upward and was increased by moving. While the pain had periods of exacerbation it never entirely left, but persisted as a constant dull ache. There had been no vomiting. The bowels were regular. He had had pain every other day in the prostatic region during micturition.

Physical Examination. Temperature on entrance 100° and pulse 62. Well developed and nourished. Pupils equal and reacted normally. Tongue protruded straight. No general glandular enlargement. Knee jerks normal. Heart and lungs normal. Leucocyte count 12000. The examination of the abdomen was negative, except for considerable tenderness in the right loin and on the right side along the course of the ureter down to McBurne's point. When seen during the next morning at the ward visit there was no spasm of the abdominal muscles, though the pain on the right side and in the back persisted. Midway between the spine of the ilium and the border of the ribs was a tender area. At the same level in the back to the right of the spine was a second tender area. There was nothing palpable at either place.

A urine examination was first reported on July 9, when it was normal, 1.024, pale, acid, without albumen or sugar.

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For the next few days the condition remained unchanged, and then came during the night an attack of pain in the right side of the abdomen accompanied with nausea and vomiting. By the next morning the attack had subsided, though the temperature had risen to 100.8° and the pulse to 75. The condition of the abdomen remained as before.

As the diagnosis seemed to lie between a rather mild type of retrocecal appendicitis and a renal calculus it was thought best to explore the abdomen and be guided in operating by the findings.

July 11. Operation. Ether. Incision through the fibres of the right rectus muscle. Peritoneal cavity opened. Cæcum pulled up into the wound. Appendix identified. Its mesentery tied off with silk. Purse-string suture passed in the cæcum about the base of the appendix. Appendix divided between clamps. Stump touched with 95 per cent. carbolic acid and alcohol, and inverted into the cæcum. Purse-string suture tied and reinforced by one or two Lembert sutures. Appendix short and without any evidence of past or present trouble. Upon exploration of the abdomen a small mass about the size of a large bean was felt in the right ureter. The abdominal incision was closed by through-and-though silkworm gut sutures, and the patient was placed on his left side on sand bags. An incision was made downward from the last rib on the right. The perirenal tissue was opened and the kidney identified. The ureter was followed downward for about an inch and a half from the lower pole of the kidney, where the stone was felt. In order to reach this satisfactorily some of the muscle fibres arising from the crest of the ilium had to be divided. The ureter, held up between fine snap forceps, was incised, and the stone was removed with some difficulty. It was firmly wedged in. A probe was passed down the ureter to the pelvic brim and upward to the kidney without finding any other stone. The incision in the ureter was closed by several fine silk sutures. The divided muscle fibres were sutured with catgut, except where a gauze wick was left to the suture line in the ureter. The skin incision was partially closed. The stone removed weighed 10 grains. It was somewhat triangular in shape, with a generally nodular surface.

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After the operation the temperature gradually fell to normal on the third day, after which time it never rose again above 99.4°. Immediately following the operation the urine passed by the urethra was bloody, but that examined on July 13 was 1.022, pale, alkaline, and contained no sugar or albumen. Some microscopic blood appeared in the specimen examined on July 15. There was some leakage from the suture line in the ureter, for urine escaped from the wound in the loin, requiring at first frequent changes of the dressings. The sinus healed, however, very rapidly, and was only an inch and a half deep on August 6, when the patient was discharged from the hospital. Following the operation the patient complained at intervals of pain in the loin, which gradually decreased. Following his discharge from the hospital the dressing was done in the Out-Patient Department till September 7, when the sinus was entirely healed, and he was discharged feeling perfectly well and strong.

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XIX.

MORTALITY AFTER OPERATIONS OF ELECTION.

By L. R. G. Crandon, M.D.

In telling a patient of the dangers and of the chances he runs in having some operation of election, statistics are of little value. Statistics must be of little value because the mortality of a given operation is influenced by so many factors, the patient's age, condition and history, and, not the least, by the surgeon's experience, skill and care.

There is some tendency, however, particularly, perhaps, on the part of the younger surgeon, to speak of certain major operations as mere trifles, things to be decided in an off-hand manner at one sitting. It seems, too, as if a wrong attitude, a lack of seriousness, has arisen from the free use of the arbitrary division of surgical operations into "minor" and "major." Because of conditions which may be revealed, because of calamities which may not be avoided, all surgery is "major."

Consequent upon a conversation with Dr. Post some time ago, I have examined the records of the Boston City Hospital for the last ten years to determine the age and other conditions which seem to have a bearing on those cases of elective operations which have been fatal.

From February 1, 1894, to January 31, 1904, there were 16,589 operations of all kinds, including both urgent and elective, done at the hospital, of which 1,483, or 11.18 per cent., died. These operations are distributed as follows:

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Date.	Total operations.	Died
1894–95	1,358	85
1895–96	1,451	109
1896–97	1,646	126
1897–98	1,623	114
1898–99	1,730	162
1899–1900	1,602	179
1900–01	1,666	182
1901–02	1,803	194
1902–03	1,923	178
1903–04	1,787	152
	16,589	1,483

ANALYSIS OF ELECTIVE OPERATIONS.

Operation.	Number of operations.	Died.	Per cent.
Inguinal hernia	635	9	1.41
Urethrotomy, not for acute retention	464	2	0.43
Hemorrhoids	454	2	0.44
Hydrocele	130	0	0
Varicocele	123	0	0
Varicose veins	95	0	0
Ventral hernia	85	0	0
Femoral hernia	56	0	0
Umbilical hernia	35	4	11.42
Epigastric hernia	5	0	0
	2,082	17	0.81

The causes of death were as follows:

RADICAL CURE FOR INGUINAL HERNIA

Sex.	Age.	Complications.
Male.	4	Pneumonia.
Male.	46	Peritonitis.
Male.	40	Apoplexy.
Male.	61	Double hernia.
Male.	40	Double hernia.
Male.	45	Double hernia, pneumonia.
Male.	52	Double hernia.
Male.	62	Septicemia, myocarditis.
Male.	27	Meningitis.

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RADICAL CURE FOR UMBILICAL HERNIA.

Female.	62	Pulmonary embolism.
Female.	60	Pulmonary embolism?
Female.	47	Pulmonary embolism?
Female.	42	Double pyo-nephrosis.

HEMORRHOIDS.

Female.	63	Chronic interstitial nephritis, edema of lungs, dilated heart.
Male.	64	Dysentery.

URETHROTOMY.

Male.	48	?
Male.	56	Pneumonia, cardiac.

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XX.

AN ARTERIO-VENOUS ANEURISM OF THE THIGH.

By Herbert L. Burrell, M.D.

The treatment of deep punctured wounds will always be of interest. The depth of the wound is not known, the wound is difficult to sterilize, and important structures may have been divided which require repair, and in some instances prompt action is necessary to avoid serious and even fatal complications.

Practitioners know that deep wounds, in which important structures have not been divided, if cleansed moderately thoroughly, frequently do well. The temptation is, therefore, to wash out the wound with an antiseptic and not to lay open the depth of the wound.

In many cases a probe is still used with the belief that it will give important information. A probe will insinuate itself between planes of muscles and entirely mislead as to the depth and extent of the wound; it certainly cannot reveal a divided nerve, artery or vein; it may reveal roughened bone or the presence of a metallic foreign body, but it certainly cannot determine whether dirt, either macroscopical or microscopical, is present. The use of a probe in such wounds is a tradition. Why this tradition maintains is difficult to understand, yet it does, and often misleads the practitioner.

The following case exemplifies some of the difficulties which attend the treatment of a punctured wound of the thigh in which an arterio-venous aneurism formed:

Stab wound of thigh; insufficient exploration of wound; development of an arterio-venous aneurism; operation; — ligature, proximally and distally, of femoral artery and

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femoral vein, and excision of the arterio-venous aneurism; continued hemorrhage, ligature of one of the deep perforating veins, control of hemorrhage; recovery.

J. M., forty, s., entered the hospital December 24, 1904. The patient's family and previous histories were negative. Present history—While drunk, jabbed a pocket-knife into his left thigh. Physical examination — On entrance patient was almost exsanguinated; radial pulse very weak; incised wound one and a half inches long on inner part of left thigh, which admitted a probe for about two inches; entered with tourniquet on thigh; no fresh bleeding followed its removal; wound cleaned, partially closed and drained. December 28 — Circulation good; drain removed. January 1—Wound showed evidence of infection, and there was a marked palpable thrill over the wound area. January 5 — Thrill and forcible pulsation more marked. January 6 — Operation.

Under ether an incision 14 or 15 cm. in length was made at the middle of the left thigh, a finger's breadth outside the femoral vessels. The knee was bent and the leg rested on its outer surface. A tourniquet was about the upper part of the left thigh ready to be tightened. The outer border of the sartorius was distinguished from the vastus internus and the muscle was drawn inwards. This exposed the sheath of fascia, Hunter's canal, which extends from the vastus internus to the adductor magnus and longus. This sheath was opened about 5 cm., and the femoral artery, femoral vein and the internal saphenous nerve were identified. A silk ligature was placed around the femoral artery, but was not tied. A point was then found where the fascia, forming Hunter's canal, the artery and the vein had been injured, for these structures were matted together, and a point of cicatrix existed from which a hemorrhage obviously might readily occur. This matted-together point on the artery and vein was carefully separated by dissection, when suddenly there came a gush of arterial blood, perhaps the size of a lead pencil. It was obvious that any attempt to suture the artery or the vein would be futile, owing to the irregularity of the cut and the gluing together of the tissues. Therefore the temporary ligature which had been placed in position on the femoral artery was tied. The hemorrhage still continued, but could be controlled by the tip of the forefinger. The

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femoral vein was then carefully isolated and ligated distally to the injury. On removing the pressure from the injured point on the two vessels, the hemorrhage still continued and was more arterial in character. With the finger making pressure on the bleeding point in the vessels, a dissection was now made to demonstrate the anastomotica magna. This was abandoned, and the artery and vein were ligated en masse, about 5 cm. apart, just above and below the injury to the vessels. The ligated mass was excised. The hemorrhage still continued to come from the deep tissues. The finger evacuated a cavity which held about 120 c.c. of blood clot, which was on the adductor magnus muscle and extended to the femur. Some of the blood clot was old; some was recent. Finally a wound was found in one of the deep, perforating veins near the femur, from which blood was pouring. This being secured, all hemorrhage ceased. The blood-clot cavity was packed with gauze and a sterile wick placed in the original wound. The wound was closed with catgut approximating muscles, and silkworm-gut in the skin. The limb was elevated, and a bandage was applied from the toes upwards. Heaters were placed about the limb.

January 10—Wound discharging — opened and irrigated — circulation in thigh remains good. January 14—The condition is the same, but there was slight bleeding from the wound to-day. February 1—Discharge has ceased and wound is granulating. February 21—Four days ago over the left heel there was found a black, necrotic area about the size of a silver dollar; no suppuration; there was some anesthesia of skin about this area; no tenderness; the wound was discharging slightly. Patient was discharged to the Surgical Out-Patient Department. Eventually the slough separated and the wound granulated. Whether this granulating area closed in later is not known.

Comments. — When the wound was first seen it was cleaned and probed; it should have been thoroughly opened and the wounded blood vessels secured. The difficulties associated with the operation were very considerable. Suppuration was present, and the connective tissue which matted together the artery and vein could not be distinguished from the walls of the vessel. The continuance of the bleeding after proximal ligation of the artery and distal ligation of the vein was perplexing, and was due to blood

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coming through the anastomotica magna. The continued persistence of the bleeding after proximal and distal ligation of both artery and vein was most disturbing, but was readily understood when the blood clot which was beneath the vessels was cleared away, and the wound in the perforating vein was recognized.

There can be no question that the earlier an arterio-venous aneurism is operated the better. In the light of my experience it seems that unless a wound of an artery and vein is operated on very early, suture of these vessels will rarely be feasible. Ligation of the divided vessels may be tried, but probably excision of the aneurism will prove to be the best and safest treatment. When seen early, suture of the vessels, if they are of sufficient size, should undoubtedly be tried, but frequently ligation will eventually be necessary. The operation should be undertaken with the clear understanding that it may tax to the utmost the anatomical knowledge, accuracy and thoroughness of the operator. A free exposure of the injured vessels is imperative to intelligently treat this most serious injury.

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XXI.

A CASE OF POTT'S DISEASE IN THE MONKEY.

By E. E. Southard, M.D.

[From the Pathological Laboratory of the Boston City Hospital.]

Following is a case of tuberculous caries of the lumbar vertebræ in a monkey (*Macacus cynomologus*). The tissue changes in the spinal canal were demonstrated by means of several stains, in particular by Mallory's phosphotungstic acid hematein method after Zenker's fixation. I am indebted to Dr. W. E. Musgrave of the Government Biological Laboratory in Manila for the monkey and for permission to report the findings, and to my colleague, Dr. W. R. Brinckerhoff, for the autopsy protocol and microscopic work on the organs of the trunk.

I. HISTORY.

The monkey, a half-grown male *Macacus cynomologus*, was brought to the biological laboratory to be killed on account of paralysis of the hind limbs. The monkey, which had been kept for some months as a pet in an American family, had shown loss of power in the hind limbs for several weeks.

On examination at the laboratory, the monkey was found tame, friendly, and in good spirits. Only ten centimeters of the tail remained, and the tip of the stump was the site of a small chronic ulcer.

The monkey dragged himself about by the fore legs, sometimes lay down, but as a rule assumed a semi-recumbent posture, with hips rotated 45° to the left and hind legs flexed, but flaccid. With the left fore paw placed on the lumbar region, position was retained by balancing on the right fore paw.

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There was no facial expression denoting pain. The animal did not cry out. No pain reaction was evoked by pressure on the spine. Sensation was absent below belt line. The monkey, however, frequently picked at the tail ulcer.

II. AUTOPSY.

The monkey was chloroformed and autopsied at once (W. R. B.).

Well developed and nourished. *Skin* normal, except at stump of tail. *Viscera of trunk* normal, except spleen, which shows numerous round opaque gray areas two millimeters or larger in diameter. All lymph nodes normal.

Brain shows no lesion.

Spine. — Cord exposed by sawing through transverse processes of vertebra. Outside the dura in the lumbar region on the left side is a pale gray-yellow gelatinous mass, composed of small semi-translucent nodules (about two millimeters in diameter) irregularly fused together and imbedded in a matrix of similar, more opaque material. The gelatinous mass is adherent both to the dura and to the wall of the spinal canal. The anterior and lateral aspects of the canal opposite the first, second and third lumbar vertebræ are affected for a distance of five and five-tenths centimeters. The material is deepest and widest opposite the second lumbar vertebra, where it spreads over one-third of the circumference of the canal. The cord was removed with dura mater intact. Sagittal sections of the spinal column show opaque yellow areas in the bodies of the first, second and third lumbar vertebræ; the areas are most extensive in the second. The dorsal portions of the vertebræ show softened, more opaque foci. The yellow areas of the second, lower posterior portion of first, and upper posterior portion of third lumbar vertebræ are continuous with the mass in the canal. The discs between the affected vertebræ are involved posteriorly. The other discs and vertebræ are normal.

III. MICROSCOPIC FINDINGS.

Sections of *lung*, *liver*, *kidney*, *intestine*, *testicle*, *epididymis* and *lymph nodes* showed no lesion. *Spleen* shows areas

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in pulp which are in part replaced with epithelioid, connective tissue, and giant cells, in part necrotic and infiltrated with polynuclear leucocytes. Section of the *tail stump* shows chronic inflammation.

For the microscopic examination of the *cord* and *membranes*, the following methods were used: Eosin and methylene blue, phosphotungstic acid hematein, anilin blue connective tissue stain, Weigert's myelin sheath stain, and Marchi's method for fat.

At the level of severest lesion, opposite the second lumbar vertebra, the dura mater has been pierced by the process, and an ovoid mass, 0.3 by 0.2 centimeters, of tubercles containing giant cells abuts upon the subarachnoid space. At this level the cord and the nerve roots are together displaced backward to the posterior portion of the dura, which is itself closely applied to the wall of the spinal canal.

The dura is elsewhere preserved. Its inner layers are denser than usual opposite the tubercles, and infiltrated immediately about the tubercles with great numbers of cells of the lymphocyte and plasma cell series. At the points of greatest pressure, as opposite the extradural tubercles, and posteriorly at the level where the whole cord is compressed by the subarachnoid mass, the dura exhibits on its inner surface strata, two to four cells deep, composed of cells with oval vesicular nuclei and tapering cell bodies. Between these run a small number of connective tissue fibrils. Collections of similar cells with a few connective tissue fibrils are found free at several points in the subarachnoid space and and are probably to be regarded as cross-sections of compressed subarachnoid trabeculæ.

The nerve bundles of the cauda equina are nowhere submitted to extreme pressure except at the one point of subarachnoid invasion. Here an occasional ventral root bundle exhibits a diffuse increase in the interstitial cells and an unusual prominence of the minute vessels, with swelling and occasional evidence of division in the lining cells. The vessel change either antedates or has little relation with the interstitial change, since such vessel changes are frequently seen, and seen also in otherwise normal root bundles. It is

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more likely that the increase in interstitial cells is related with a change in the myelin, since adjacent sections of the same bundles, stained with Mallory's connective tissue stain, show a loss of the red staining myelin and the fibre spaces filled with a faintly blue staining homogeneous substance. The Marchi preparations also favor the explanation of the interstitial changes as a reaction to myelin change. Precisely the same bundles cannot be followed, however, and the interstitial changes are harder to interpret in Marchi preparations.

The pia mater has no share in the lesion. There are no variations in depth of layer to correspond with the surrounding lesions.

The lesions of the cord are of interest. Sections of various levels, stained for fatty degeneration by the Marchi method, show blackening of a scattered, but almost symmetrical character, which in the higher levels becomes confined to the outer fourth of the posterior columns and narrow strips at the lateral borders of the lateral columns. Sections of adjacent segments, stained for myelin by the Weigert method, show no change. On the contrary, adjacent segments, stained by the phosphotungstic acid hematein neuroglia method (Mallory), show increase of neuroglia fibrils in the same areas which are blackened by the Marchi method. These new fibrils are still found in close spatial relation with neuroglia cell bodies. Recourse to the eosin and methylene blue method of staining shows that the neuroglia cells, responsible for the fibrillary gliosis, have large cell bodies and large vesicular nuclei with prominent nucleoli. Active neuroglia changes with new fibril formation are therefore demonstrable in this case in the fatty stage of secondary degeneration.

The fibril content of the spinal cord of the monkey can be well demonstrated by the phosphotungstic acid hematein method. The higher levels in this case stain better than the edematous levels opposite the tuberculous masses in the lumbar region. In the upper levels the fibril content of the subpial region and of the white matter approximates the fibril content of the same regions of the human cord after similar fixation. The fibril content of the gray matter in the

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monkey's cord is also high, but the neuroglia about the central canal is much less dense than in adult man.

The nerve elements of the cord in this case show little beyond the effects of secondary degeneration. As mentioned in the account of the root bundles, the anilin blue connective tissue stain is useful employed in sections adjacent to sections stained with eosin and methylene blue and with phosphotungstic acid hematein. The loss of myelin, which normally stains yellowish-red, as a rule in the form of a delicate reticulum, is readily made out with the anilin blue stain.

Spaces in the white matter, similar to the spaces familiar in the human cord in pernicious anemia and like conditions, are seen also in this cord. They are most frequent in the posterior and anterior columns in the levels opposite the tuberculous masses. The spaces, which are sometimes fifty to one hundred microns in diameter, are often filled with homogeneous material or granular coagulum and occasionally contain a mononuclear cell, possibly an endothelial cell.

The nerve cells of the cord fail to show important changes. A few only show the axonal reaction. In almost all the nerve cells, the Nissl granules stain well; but, in the levels opposite the severest lesion, some of the cells are reduced in size, apparently from loss of substance between the granules.

IV. SUMMARY.

1. A half-grown *Macacus*, autopsied several weeks after onset of paraplegia, showed tuberculosis of the spleen and of the lumbar spine. There were extra dural masses opposite the upper three lumbar vertebræ together with penetration of the dura and compression of the cord at the second lumbar vertebra.

2. The neuroglia fibrils in *Macacus cynomologus* can be demonstrated well by the use of the phosphotungstic acid hematein method after fixation in Zenker's fluid. The picture approximates that of the human cord similarly treated. The extent and character of the neuroglia changes found in this case suggest profitable lines of experimental work on cellular and fibrillary gliosis in the monkey.

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3. Areas of secondary degeneration in this case, studied comparatively by the methods of Marchi for fat, of Weigert for myelin, and of Mallory for neuroglia and for connective tissue, demonstrate active neuroglia changes with new fibril formation in an early stage of secondary degeneration. The fatty degeneration is attended with fibrillary gliosis, the onset of which antedates a demonstrable loss of myelin.

4. The connective tissue cells in degenerated nerve bundles in the cauda equina show activity analogous to the neuroglia cell changes found in the cord.

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XXII.

NOTE UPON AN ACCESSORY PANCREAS IN THE INTESTINAL WALL.

By Paul A. Lewis, M.D.
Second Assistant in Pathology.
[From the Pathological Laboratory of the Boston City Hospital.]

Masses of pancreatic tissue in anomalous situations occur frequently in the lower animals and not infrequently in man. As the perfect preservation of a small amount of such tissue might prevent that form of diabetes which is associated with cirrhosis of the islands of Langerhans, and as the accessory organ might escape disease affecting the pancreas, these anomalies have a noteworthy interest.

The following is the gross and microscopic description of such an accessory pancreas with fully formed islands of Langerhans:

Autopsy. — Boston City Hospital, 04.198.

Cause of Death. — Staphylococcus Aureus Septicemia.

Gastrointestinal Tract. — Situated in the mesenteric border of the small intestine 85 cm. from the pyloric orifice of the stomach is an island of tissue resembling the normal pancreas in color, consistency and markings; it measures 16 by 12 by 4 mm.

Microscopic examination shows that the pancreas is normal. The accessory pancreas is placed in the muscular layers of the intestine, extending from the submucosa to the peritoneal surface. The intestinal muscle bundles are intimately interlaced with the pancreatic interstitial connective tissue. Pancreatic ducts are present and apparently patulous. The parenchymal tissue is fully differentiated and is normal. The islands of Langerhans are fully formed and relatively as numerous as in the normally situated pancreas.

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XXIII.

REVIEW OF MASTOID CASES OPERATED IN AURAL SERVICE OF BOSTON CITY HOSPITAL, OCTOBER, 1903, TO MAY, 1904 (INCLUSIVE).

BY GEORGE A. LELAND, M.D.

To the Aural Department of the Boston City Hospital is given the care of what cases are admitted to its service in the main hospital, also the care of those aural complications which may arise in other patients both in the main hospital and in the contagious department. From October 1, 1903, to May 31, 1904, at the main hospital, and from the same date through the summer of 1904 at the contagious department, the service was exceptionally heavy as to numbers of cases, and also included some of more than ordinary interest. Of cases coming to mastoid operation during this period there were in the main hospital forty-two cases (one having a double mastoid) and in the contagious department twenty-four cases (three having the double operation). Thus there were seventy cases of mastoid operation in the aggregate. In these there were but three deaths; one from cerebellar erosion or superficial subdural abscess, one from meningitis with acute cerebral edema probably (no autopsy allowed), and one case of diphtheria, in which pneumonia developed and was the cause of death one week after operation. The ages of these patients were between thirteen months and forty-six years at the main hospital; and between about ten months and twenty-eight years at the South Department. At the main hospital there were twenty-one males and twenty-one females; at the South Department nine males and fifteen females. At the main hospital the right side was operated twenty-four times, left seventeen, both sides once, and one

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not given. Among the contagious cases, right fourteen times, left seven and both three.

It is interesting and instructive to note how frequently the classic symptoms were absent, so that in some of the cases with no redness, swelling nor marked tenderness the mastoid process was found nevertheless full of disease, and here at the main hospital there were twenty-four cases of acute discharge (in which it was induced by paracentesis of the drum-head eleven times), while pain was absent three times, edema seven times and bulging of the posterior wall nine times; while in four cases both superior and anterior wall were bulging in addition to the posterior, and in three other cases the superior and posterior wall bulging into the lumen of the canal.

Among twenty-four cases in the South Department there were eighteen cases of acute mastoiditis. These were almost all accompanied by the ordinary symptoms of redness, edema, tenderness and pain as is usual, but in three patients (two being children, aged twenty-two months and three years respectively, and the other a woman twenty-eight years of age) there was an absence of pain on admission, of temperature, tenderness and swelling over the mastoid. One of them only had a bulging of the posterior wall, but two had bulging of the superior wall of the canal. This woman of twenty-eight years of age, a case of measles, had no affection of the ear till suddenly pain with probably effusion occurred in the left middle ear with a swelling of the mastoid almost immediately. Her maximum temperature was only 102°. She was seen about noon and was ordered to be prepared for operation in the evening. At that time there was congestion and a slight bulging of the drum-head with marked tenderness and swelling over the mastoid; temperature 102°. At the evening when she was brought to the operating table her temperature had diminished to normal, there was only a slight congestion of the drum-head and but a slight tenderness on deep pressure over the mastoid. There was doubt as to whether an operation would be necessary, but as she had had the symptoms mentioned it was concluded that that meant mischief, and that as involvement of the ear in measles has been found

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to be especially treacherous, it was deemed best to at least ascertain whether there was anything of importance in the bone or not. The usual incision was made, the periosteum came away with great ease, revealing a roughened bone surface with a small perforation leading through it into the mastoid cavity, the periosteum evidently having been separated from the bone and then unaccountably replaced. The cortex was removed with a sharp spoon, the cavity found to be full of granulations bathed in pus; and the whole interior was thoroughly cleared out, irrigated and packed. The others were cases of scarlet fever, and showed a similar absence of the usual signs of mastoid involvement. These cases point the argument that we cannot always tell from external symptoms how much destruction is going on where suppurative conditions have attacked this region in the exanthemata. From these and from other experiences in the same line it seems to us to be the best plan to operate on mastoids which have shown during the current exanthematous disease symptoms of acute involvement, even though they have apparently been allayed.

This brings up the question of the efficacy of the use of the ice-bag in acute involvements. In cases in the main hospital it is the routine procedure when tenderness appears on the bone to use the ice-bag not longer than forty-eight hours lest it mask the symptoms and give us false sense of security while the disease may be progressing. After this length of time it is left off, and usually if the pain and tenderness recur it may be tried for a few hours longer, but generally it is considered that the operation should be performed, especially when the second recurrence of edema makes it manifest that there is pus in the deeper tissues. In the South Department, on the other hand, where there is a marked virulent infection, if the temperature keeps up, the ice-bag is not relied upon to abort the disease, but with the other symptoms, or even in the absence of other symptoms, with a history of acute inflammation, even if they have subsided, as mentioned above, the operation is advised in every case; and it must be further said that in the immense majority of cases, probably in all of them, are found conditions of which it would be futile to expect resolution.

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Among the nineteen chronic cases there were seven with pain, ten with tenderness, thirteen with external edema, fourteen with bulging of the posterior wall; the superior wall was sunken only three times and the anterior but twice. And it is very significant that in six cases where there was neither pain, tenderness nor bulging of any inner walls, there were found pus and granulations in the mastoid process, and in three of those the lateral sinus was, or had to be, exposed, because of a carious inner cortex, and in four only was a sclerotic or eburnated bone mentioned. Of these nineteen chronic cases only four complained of headache on admission, and only five had a temperature of 100° or over, only two having 102°, and one of these was the case of cerebellar abscess, to be further mentioned. Of the other four cases, two only had an external cellulitis; and two had probably slight septic absorption, as the inner cortex was carious or absent.

In all of these chronic cases except two there was a history of pain before admission, and in one other the history is doubtful. But in all of them at the operation were found granulations in the mastoid antrum, and in the mastoid process unless it was sclerotic, and in most of them free pus. Hence the symptom most significant in these cases of chronic purulent middle ear catarrh is the *discharge*. The middle ear cavity is very small, probably not large enough to contain more than a very few drops of fluid. If there is enough to run out into the external ear or auricle, or even to run down on the face or stain the pillow at night, it is reasonable to suppose that there is more chronic inflammatory involvement than of the middle ear itself; *i.e.*, that it extends upward and backward through the aditus and involves the antrum. Nor is a copious discharge only significant of deeper involvement. It may also happen that the slight amount of discharge, which is not sufficient to run out, but only to remain in the fundus of the canal to decompose and become foul, being in a deep warm narrow canal, is also significant of continuous caries which may insidiously extend deeper and deeper into the cellular mastoid process, to suddenly appear on the inner cortex and there to set up a localized meningitis, or a

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mild pyemia from absorption through the walls of the lateral sinus. It will be seen from the above that the chronic cases, especially those where the discharge is not sufficient to be obtrusive, are in a more or less dangerous position, if the presence of the usual conventional symptoms are relied upon exclusively, as the only one noticed may be pain, which is so often disregarded or treated at home (which is frequently the same thing) by external applications, or what is far worse, by dropping into the external canal certain abominations such as laudanum, sweet oil, hot onion hearts, etc.

It is well to call attention here to one of the reasons for opening the mastoid given by Sir William Macewen, at the International Otological Congress at London in 1899, because he clearly showed the weight of certain symptoms in cases of chronic purulent discharge, which may have other interpretations; and the evidence of which was only elicited in some of our cases by careful investigation, because such symptoms are usually not attributed to the ear, and also because of the rather obtuse intelligence of some of the patients who are unaccustomed to very carefully observe their mild sensations.

He says, "The pyogenic process may, however, proceed inwards, giving rise to symptoms often misunderstood or attributed to other causes, and may eventually prove fatal, or, by undermining the constitution, thereby pave the way for the advent of other lesions. Many patients thus affected, though able to pursue their usual avocations, are yet subject to periods of malaise, with occasional recurrent slight febrile attacks, irritability and nervous hyper-sensitiveness exhibited in unevenness and irascibility of temper, which attacks last from a few days to a week or more, leaving the patient slightly weaker, though relieved from the depression and fit to enjoy life. These attacks are so frequent, and the patient becomes so used to them, that he comes to regard them as a part of his ordinary habit, and often attributes them, with considerable plausibility, and sometimes with point, to colds, chills, biliousness, indigestion," etc.

Hence it will be seen that there is a certain line of cases demanding operative interference where symptoms consequent

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on slight suppuration are very obscure. The assistance of the thermometer here is very marked, since during these chilly states, or when the patient is suffering from malaise, it may show a slight elevation which may be transient and occur at irregular times of the day. If it were possible, it would be advantageous to have blood counts made at these times, but as yet such opportunities have not presented themselves.

In the twenty-four cases of the South Department there were five (one being double) where there was a chronic discharge before entrance. These cases, of course, were excited into acute excerbations by the exanthem from which they suffered, and hence the obscure symptoms mentioned of those cases occurring without this complication in the main hospital were masked, and they all had the ordinary classic symptoms of pain, tenderness, mastoid edema and bulging of the walls which are found in cases of acute mastoiditis; and here also at the operations were found carious bone and pus and granulations in the mastoid processes, the same as in the other chronics; but in none of them, as they occurred in younger children (all being under seven years of age), was the inner cortex found to be softened or absent.

The exceptional success in these cases in respect to mortality is probably due principally in the minds of the operators to the fact that all of the diseased tissue was removed, every vestige of carious bone or purulent infiltrated or inflammatory tissue wherever it extended was thoroughly scraped away, so that the mastoid process itself was almost invariably left as nothing but a very thin shell. This cavity was packed and allowed to granulate in most of the cases, both acute and chronic. A few radical operations were done, and these were grafted in the usual manner with skin removed from the inner aspect of the thigh above the knee, but there were ten cases (nine in the main hospital and one in the South Department) allowed to fill up with blood clot, and the wound sutured immediately. Of these cases, one in the main hospital, a feeble-minded, ill-nourished individual of three and a half years of age, broke down in twenty days, and two others sloughed within a few days; and one, a well-nourished woman

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twenty-three years old, who had the double operation, left the hospital, and within a month it was reported that her left mastoid had sloughed. One in the contagious department was a case of measles where the clot also broke down. It seems, therefore, that one-half of the cases were successful and that these have not given trouble so far as known. It may, therefore, be asserted from this and subsequent experience that this procedure of Dr. C. J. Blake's sometimes produces a very quick cure after the mastoid operation; and also that, even when the clot breaks down, that part of it which lies contiguous to the bone surface furnishes quick and satisfactory nourishment for the new granulations and for the new growth of osteoblasts, so that they have been very much hastened and therefore the length of time for healing very much diminished. Moreover, in some cases where the granulations seem to be sluggish, flabby, pale and ill-nourished they have been bruised and the blood clot allowed to remain; *i.e.*, they have been dressed in their own blood, as it were, and in these cases the healing has evidently been accelerated.

The length of time during which patients have remained in the hospital varied very greatly, from nine days after the clot operation to one hundred and fourteen days, the latter having been caused by many complications. Some of these cases have also had to be operated upon a second time because of the spicules of carious bone which may have separated subsequent to the operation, or because plastic operations have been necessary.

Among these cases were four of the Bezold variety with pus infiltration down the neck through a fistula in the digastric fossa. One of these was operated on one of the surgical services for a deep abscess in the neck, and afterwards transferred to the aural service to have the *fons et origo mali* removed, which was done by the thorough removal of the mastoid process, except the inner shell. The other three cases were operated on as for an ordinary mastoid, except that the inner cortex in the digastric fossa was removed, exposing the insertions of the muscles in this vicinity, and the tract of pus exit probed, and the pus pressed upward from below when it was indicated. This procedure was found in each case to

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be sufficient for drainage and the cellulitis rapidly subsided, in no case necessitating any operation in the neck. This would seem a priori to be insufficient as a surgical measure, but when it is remembered that the patient is in the recumbent position for a number of days it will be seen that the pus, seeking its easiest passage, has the assistance of gravitation almost all of the time; and that this, assisted by the natural contraction of the muscles and tissues of the region, is evidently sufficient to drain the abscess, even though in an upright position it is dependent.

In addition to this general review the following cases present some points of interest and are herewith reported more or less in detail:

Case 4. Otitis media purulenta chronica with cholesteatoma. Complete exenteration. Four operations. Eighty-two days in hospital. Discharged well.

Edw. C., fifteen years. Admitted November 16, 1903. Has had purulent, odorous discharge from right ear for many years, of which the history as also that of the pain are indefinite, till ten days ago, when an acute exacerbation seems to have taken place with great pain and swelling behind the ear. On admission, temperature 98° with pain in and around the right ear, tenderness and edema over the mastoid process.

Operation on the 17th. Usual incision through the periosteum gave vent to considerable pus and came down upon superficially eroded bone, with carious openings into the mastoid process, which was a large cavity with partially absorbed trabeculæ between the pneumatic cells, and was filled with unhealthy granulations, much débris, and foul cholesteatomatous masses, some of which were so adherent to the bone as to give the appearance of black stains. The inner cortex was soft, in places absent, and the lateral sinus with a greenish, gray opaque wall lay in the bottom of the wound at completion of the operation, but was soft, yielding to pressure with finger, but not pulsating. Cavity gently irrigated and packed with iodoform gauze, and patient put to bed to await developments, *i.e.*, possible signs of lateral sinus involvement. These did not appear, and the highest tempera-

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ture reached was 101.5°. At the subsequent dressings the newly forming granulations showed that the cholesteatomatous infiltration had not been wholly eradicated, a very difficult process in an old case; and this was not wholly removed by the use of peroxide of hydrogen and strong antiseptics. Hence on the 29th of November under ether a complete exenteration was done, attic, middle ear, etc., all thrown into one cavity and thoroughly curetted. A probe found a dehiscence in the Fallopian canal and caused twitching of the muscles of the right side of the face. The wound was not closed because of the possible recurrence of the cholesteatoma, but was packed with iodoform gauze. At the dressings the wound now appeared clean, and on the 12th of December under ether the granulations were smoothed down and the interior covered with Thiersch grafts. These took quite well, and no appearance of this septic epithelial débris appearing the posterior wound was closed under ether on the 20th of January. Healing was complete, and he was discharged well on the 6th of February.

This case shows how much infectious material may be carried around for a long time without apparent danger, and how much trouble there is in its eradication.

Case 8. Otitis media purulenta chronica; blood-clot dressing.

F. T., male, forty-six years of age. Admitted January 4, 1904. Measles in childhood; left ear discharged for four years afterwards; right ear began discharging twenty-eight years ago; has had occasional attacks of pain with irregular periods of discharge since.

Examination. Left ear shows cicatricial drum-head, right ear perforated drum-head with marked bulging of posterior wall.

Operation January 5. Large amount of carious bone and granulations removed, cavity scraped clean, forward to the end of the aditus, care being taken not to enter the attic; cavity allowed to fill with blood clot and wound sutured both through the skin and periosteum, a small hole being left below, in which a small wick was inserted to remove the more fluid parts of the blood to insure a firm clot. Healing by first

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intention; wick removed in about three days; excavated area feeling solid to moderate pressure. Duration of time in hospital, fifteen days, but could have been readily reduced to eight. He was, however, detained in order to be sure that there was no immediate breaking down, and was discharged in fifteen days solidly healed and apparently restored to his usual health with the middle ear only slightly moist. So far as known this case has not given any further trouble.

Case 10. Otitis media purulenta chronica. Bezold mastoiditis.

T. M., male, thirty-five years of age; admitted January 16, 1904. Left ear has discharged for a year. For two weeks has had steady pain in the ear and through the head, with some soreness on the right side. Has small dermic swelling of the left auricle, probably eczematous, not due to erysipelas. Temperature on admission 102°. Narrowing of the external canal, especially of the posterior superior and anterior inferior walls. Considerable pain referred to behind the ear (left) with slight edema and considerable tenderness; it is rather difficult to see whether the narrowing of the canal is due to edema or to the inflammatory process, although probably both are factors. On account of the temperature and the indefinite history of fever with slight chilliness, blood count was made and found to show 14,000 whites. Examination of the eyes showed fundi normal; examination of the left ear showed an old cicatrical drum-head with perforation, although not easy to make out because of swelling of the canal. The mastoid process was somewhat swelled, especially in the lower part; this swelling extended one-half way down to the clavicle, very tender to the touch, brawny and tense.

Operation on January 17. Cortex, after removal of the periosteum, bled from many points. The attachment of the muscles was very dark and freely bleeding. Removal of the cortex revealed the mastoid process full of granulations and broken down débris. The antrum was especially full of old fibrous granulations. The bone over the digastric fossa was soft; removed; a small amount of pus was evacuated. Posterior cortex about the same, also removed, exposing the

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lateral sinus. This case went on to satisfactory healing; the swelling in the neck disappeared, drainage through the mastoid wound being amply sufficient.

Case 15. Otitis media acuta. Mastoiditis. Beginning Bezold. Blood-clot dressing. Recovery.

F. M. C., female, twenty-two years of age. Admitted February 5, 1904. With no history of previous ear disease, severe pain began in right ear three days ago. Paracentesis was done at Boston Dispensary. For next two days severe pain in ear, running down neck, with chills, but no marked rigor. On admission temperature 100°. Profuse sero-pus discharged from the right ear. Perforation in lower posterior quadrant, through which the discharge pulsated. The lower half of the mastoid and the upper third of sterno-cleido-mastoid region were swollen, red, tender and rather stiff. This infiltration was present in right side of the throat, which looked swollen, and opening the mouth was painful and restricted, suggesting inflammatory involvement of the tonsil.

Abortive treatment was attempted, ice bag, hot irrigations, rest in bed, restricted diet, etc., but operation became necessary on the 13th of February. Highest temperature 102°.

The mastoid process consisted of hard bone with small cells, the bone being inflamed and bleeding much. There were few granulations in these cells and in the antrum. The bone was cleared out till it was yellowish white, with no bleeding or oozing spots, and allowed to fill with blood clot furnished by the vessels around the incision through the soft parts, and the incision then sutured, a small wick being left in the lower part. Healing by first intention, and the patient was discharged in thirteen days after the operation.

Contrary to our usual custom, this patient was not operated upon immediately, but it is evident that eight days would have been saved if she had been.

In this case also we have the tendency of the suppurative process to point inward, as shown by the marked cellulitis down the neck, even presenting inside, which involved the posterior belly of the digastric muscle.

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Case 16. Otitis media purulenta chronica. Facial paralysis. Polypi. Bezold mastoid. Erysipelas. Recovery.

S. H., female, forty-five years of age. Admitted February 26, 1904, a very large, fleshy woman. Her left ear has discharged more or less for thirty-nine years with unnoted pain, but has had no treatment. Five days ago pain was quite marked, with swelling and tenderness behind the ear, and soon afterwards the face began to turn towards the right. On admission, temperature was 100°. Discharge somewhat from the left ear, with polypi filling the whole of the external canal. Behind the ear, much swelling and tenderness, which extends considerable distance down the neck; also above and around the ear, hard, brawny, pitting on pressure, which is quite painful. There is complete paralysis, facial, on the left side. The canal narrowed by edema of its walls but slightly. Eyes examined, and slight choroidal atrophy reported with some congestion about the discs.

Operation the same day revealed a good deal of free pus and granulations in the large pneumatic mastoid with peripheral bone easily bleeding. The facial canal and the horizontal semicircular canal were exposed, inflammatory carious tissue being gently scraped away from the region of the former, digastric fossa exposed, and sinus leading downward gave exit to a considerable amount of pus. The wound was packed with iodoform gauze. February 29, the temperature rose suddenly and erysipelas developed. Transferred to Ward L, and usual treatment instituted.

March 1. Temperature still elevated, white count shows 36,000.

March 2. Temperature 103° to 105°, rather more swelling down the neck, the wound dressed and quite a large amount of pus evacuated from the fistula through the digastric fossa. After this date symptoms gradually subsided, swelling in the neck diminished, facial paralysis disappeared, the wound granulating satisfactorily, and she was discharged relieved; that is, the wound not completely healed, but to be dressed at the Out-Patient Department, March 22.

Case 20. Otitis media acuta. Mastoiditis. Epidural abscess. Recovery.

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Thomas P., twenty-eight years of age. Admitted March 1, 1904. Seven weeks ago began to have pain in left ear, followed by discharge. One week ago tenderness and swelling behind ear, extending forward on to the cheek and down the neck. Considerable headache, but no vertigo, nausea nor vomiting noticed.

On admission, temperature 100°, with pain in and around the ear with tenderness and edema, and also edema of the bony canal walls, posterior, superior and anterior. Auricle displaced forward and down. This swelling extended half way forward on malar region and considerably down the neck. There was a perforation through the drum-head and a copious discharge.

In the evening had a marked chill, temperature 103.2°, afterwards moderate perspiration. White count showed 20,000.

March 2. Another chill with vomiting, temperature 103° to 105.6°. House officer, however, reported only 5,000 whites.

Operation. Purulent collection subperiosteal, rough bone, carious opening into a cavity which took the place of the mastoid bone, and was filled with pus and granulations. The inner cortex was rather soft, with loss of continuity, the removal of which revealed an epidural peri-sinous abscess, with the inner wall covered with protective granulations. The tegmen antri also easily came away showing slightly discolored dura.

Wound thoroughly cleaned with hot sterile irrigations gently applied and packed with iodoform gauze. Recovery uneventful. Discharged on March 17.

In this case may be seen what alarming symptoms may be called forth by merely superficial conditions, the thorough removal of which is sufficient to abolish them all. It may be well questioned whether the sinus, covered as it was with granulations, did not admit pus enough to cause the chills and high temperature; and so it might have been considered that a beginning thrombus, at least a mural one, was in process of formation, and an excavation of the sinus called for, as has lately been advocated under similar conditions.

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The result eminently justified the conservative course pursued.

Case 23. Otitis media purulenta chronica, with attic and antrum involvement. Cerebral symptoms. Operation. Recovery.

Ellen C., twenty-nine years of age. Admitted March 4. Seven years ago pain, and discharge from left ear. Ceased in three months. Afterwards hard of hearing. Recurrence one year ago, with headache, profuse discharge, chills, vertigo (tendency to fall forward, never sidewise) and vomiting. This attack lasted three weeks. After this always had discharge with colds, but no other trouble except deafness. Three weeks ago, following a cold, pain in right ear with headache and soreness of the whole head, with nausea and vomiting on afternoon of March 2 and 3. Paracentesis was done on March 2. Temperature had been between 99.2° and 101.5°.

On admission, temperature 99°. Complains mostly of tenderness and soreness of whole scalp, especially marked over right temporal bone, and over right mastoid tip, which is exquisitely sensitive. Back of neck is sore also, but not stiff. Vertigo is marked on moving head, sitting up or lying down. Photophobia present. Eyes normal, both as to external movements and ophthalmoscopic appearances. Some chilliness during the evening, no rigor. White count shows but 7,600. Examination of ears shows right membrana tympani slightly bulging, swelling most marked in membrana flaccida, with redness of contiguous walls of canal, no discharge. Agglutinated paracentesis opening in inferior posterior quadrant. Canal wall tender and slightly red. Left ear shows absence of membrana vibrans, with profuse whitish sero-purulent foul discharge, suggesting cholesteatoma. Membrana flaccida white, moist, underneath which may be seen a dirty, yellowish substance. Posterior wall red, swollen and tender to pressure with cotton applicator.

Under small amount of ether the posterior segment of right membrana tympani was severed, and two incisions made horizontally in Schrapnell's membrane, one each side of the neck of the malleus. Ice bag to right mastoid and hot irrigations.

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March 5. Considerable relief to right ear. Drs. P. C. Knapp and J. J. Thomas, in consultation, opined that there was no meningitis, but possibly an extra-meningeal (pachymeningitis) pressure or involvement of the labyrinth and no localizing symptoms of brain abscess.

March 6. Operation. After removal of periosteum, cortex normally white and glistening, bone sclerosed, especially forward and above, large antrum with hard, gritty walls, full of old granulations, no pus. Thoroughly curetted and walls made smooth, also forward and upward aditus enlarged and smoothed well into the attic. Cavity packed as usual. Patient complained of much headache after operation and was very nervous, but aggravating symptoms rapidly subsided, and she made an uneventful recovery, and was discharged, relieved, after twenty-four days in the hospital, wound nearly healed, and middle ear nearly dry. The right ear gave no further trouble.

In this case is seen what aggravating and truly alarming symptoms may be induced, especially in an intensely nervous woman (though by no means confined to such) by pressure in the attic brought on by slight acute inflammatory conditions, as witness those in connection with the right ear; also how similar disturbances may be brought about by a slight increase in the size of chronic granulations in an old mastoid antrum, the only other evidence of which may possibly be a chronic intractable, recurrent discharge. Cases like this also differ from those so succinctly described by Sir William Macewen, in that symptoms are evidently caused by pressure rather than by absorption.

Case 34. Otitis media acuta with mastoiditis; sluggish infection; much delayed operation; acute cerebral edema (?); death.

Elba C., twenty-seven years of age, a spare, Swedish housewife, was admitted to Ward O. (P. R.) with history taken from private notes. She was sent to me by Dr. F. S. Parsons of Dorchester, March 17, 1904. Never had trouble with ears before, except slight ear-ache a year ago, which only lasted a day and left good hearing.

Thirteen days ago, "with an awful cold," a regular ear-

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ache began, very severe for about a week. A blister seemed to give some relief. Thought it was an abscess, but it did not discharge, and is now very deaf. At first was very dizzy and had six or seven vomiting spells. Could not walk for first three days, and had to remain in bed. Considerable pain at night, so that she has not slept more than an hour or so. Was sore all over left side of head for a few days, and had much pain and tenderness behind ear. First day was chilly; now complains mostly of tinnitus.

Examination shows left membrana tympani very thick, dull red posterior segment bulging and contiguous parts of canal also red and swollen. A large paracentesis was made, evacuating bloody serum; irrigations every two hours, with sol. corrosive sublimate, 1 : 4000.

March 21. Has been free from pain even at night since last visit. Less tenderness of mastoid. Paracentesis opening discharging yellow pus. Posterior wall of bony canal red and slightly swollen. Membrana tympani much swollen, so that the hammer handle is deeply sunken between the two halves. Mastoid operation advised; declined because wishes to return to Sweden for the summer vacation. To use ice to mastoid.

March 23. Ice removed nocturnal pain; but had some pain yesterday, "not to speak of."

March 26. Much pain for two hours last night; but mentions throbbing through the head. Slept last half of the night; only five or six drops of discharge last night and none yesterday at all. No increase of discharge after pain. A. A. S., three and one-half feet; inflated with Politzer's A. D., nine feet. Membrana tympani very red and thick, slight pain after P. A. D. and a small amount of discharge blown out. No visible perforation. Nose free; region of Eustachian mouth treated with astringent solution.

April 2. Has had less discharge; no pain, but headache over eyes for two or three days off and on, but has this pain quite often. Less tinnitus, less soreness of mastoid, membrana tympani very thick, depressed at umbo with small pouting perforation in posterior segment. Hears A. A. S. 20 inches. Inflated with Politzer's A. D., four feet.

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April 8. Has no more pain, but discharges at night a very little. Still slight tenderness of tip of mastoid. Hears A. A. S. five feet. After P. A. D. three or four times, thirteen feet. Still refuses to consider operation, which is urged for safety.

April 18. No pain, slight discharge still, but more running at night. Mastoid tenderness back of tip and over antrum. Slight sensation of stiffness on opening mouth.

April 20. Increase of pain in ear. Pouting perforation larger and membrana tympani still very thick. Mastoid quite tender. Large paracentesis. Only blood evacuated. Sent to hospital for operation. Entered same day. Temperature 98.5°. Profuse discharge. Large cut through posterior segment of membrana tympani. Redness and edema over mastoid; canal posterior wall thick and red. No head symptoms noted.

April 21. Operation. Cortex white, hard, thick; removed; bone pneumo-diploetic, large cavity cleared out, with lateral sinus bony wall deep posterior. Many pockets of pus, with large superficial air spaces extending backwards almost to the occipital bone and forward into zygoma. Antrum full of pus, granulations, and bony spicules. Diseased bone curetted away till horizontal semi-circular and facial canals came into view. External canal and mastoid cavity thoroughly irrigated and wiped out and the whole packed with iodoform gauze.

April 23. Temperature elevated all day, about 101°. Vomited a good deal. No other symptoms suggested intracranial complications.

April 26. Wound dressed, clean, granulating. Temperature 100.2°.

April 28. Temperature 99°.

April 30. Temperature normal.

May 2. Up in chair. Wound clean, granulating, healthy.

May 6. Same report.

May 8. Walked in from an airing out on the bridge between Wards O and D apparently dazed, but seemed to recognize everyone, this condition of slight lethargy being attributed to neurosis, or a sudden neurasthenic condition.

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Pupils equal, react normally. Knee jerks not increased. Tongue normally protruded. Temperature 100°, pulse 84.

May 12. Remains in about the same dull condition. Talks occasionally; rather brighter; vomited twice; complains of headache.

May 16. Improved mentally. Wound clean, granulations healthy, filling in well.

May 20. Mind duller; difficult to form sentences; slight aphasia, cannot tell what she wants; slight headache; vomited once or twice in last two days. Temperature normal. Examination of eyes shows fundi normal.

May 21. Slight improvement. Seen by Dr. G. G. Sears, who said the question was between meningeal irritation and exhaustion psychosis, or some other cerebral condition.

May 23. Seen by Drs. Knapp and Courtney, who diagnosed an abscess in left temporal lobe and advised operative exploration.

May 24. About the same lethargic state, though answered questions and talked a little. More uncontrollable dark green vomiting. At 11 A.M. dull, listless, twitching of muscles, with whole right side rigid. Temperature 100°. Coma supervenes. After much persuasion husband allows further operation; well set and copious granulations cleared out of mastoid. Incision made three inches upward from mastoid opening, separated, and an opening made above tegmen with rongeur forceps 1½ inch in diameter. Dura bulged into opening, tense, normal color, not pulsating. Dura opened, brain substance protruded and then began to pulsate very rapidly. Director passed in deeply in four different directions; no abscess contents nor cavity found. Brain then began to protrude rapidly more and more and was very tense. Exploration with finger advised against. Bandage applied with pad, very tightly. Taken to bed. Ten minutes later cyanotic; pulse 150, irregular; and death ensued in about half an hour after operation.

No autopsy was allowed.

In this case we were confronted with the obstinate refusal of an operation when a comparatively simple one would probably have saved the life. Moreover, this is one of the

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class of cases where the affection of the middle ear seems to be such that vigorous, ordinarily approved treatment seems to be powerless, at least outside of constant hospital care, to abate the results of a rather sluggish infection. That this infection was sluggish seems to be proved by the long continuance of the disease (from March 4 to May 24) without more marked virulent symptoms. It is to be regretted that a bacteriological examination was not made, for after the infection became mixed it was too late for satisfactory data. It also shows what a dangerous combination is a thick drum-head with a pouting perforation, and a thick, white, ivory hard mastoid cortex.

Case 36. Otitis media purulenta chronica, with posterior auricular fistula leading to carious mastoid. Operation. Recovery.

Frank W., aged eight years. Admitted February 19. Well nourished and otherwise a healthy boy. Was operated on at this hospital at one and one-half years of age for acute mastoiditis on right side. Ear has discharged ever since. Mastoid wound was very long in healing and sinuses have broken out and discharged at intervals ever since, the last one persisting. On admission temperature 98°. No complaint of pain or tenderness, but only the persistent, annoying discharge both from the canal and from a post-aural fistula.

Examination shows a large perforation of drum-head. Probe enters a defect in scar of previous operation and detects plenty of rough bone, passing in deep enough to reach the antrum; and, bent, can pass forward into the aditus.

February 20. Operation. Incision through the old scar. Large passage bounded by hard, bony trabeculæ leads to antrum which is walled in by hard bare bone, all evidently newly formed bone imbedded in soft granulations bathed in pus. A large part of the previously excavated cavity had evidently likewise been filled in with bone. This was scraped away down to smooth, hard bone, the lateral sinus being exposed, and also the horizontal semi-circular and facial canals.

The wound was so clean that it seemed well to dress with blood clot; but the cavity having been so long infected and

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the middle ear accessible through the aditus, it broke down in four days. The wound was then opened, and cavity packed as usual, but the inner surface of the cavity was well covered with granulations.

March 8. Discharged, nearly healed.

This is reported as an example of a fortunately not common class of cases in which a secondary infection takes place through the middle ear, and when it is considered that this already infected, or from the throat easily reinfected cavity, may not be wholly shut off from the mastoid by a bony or fibrous plug in the aditus, it is not far from strange that this untoward event does not more often occur.

The preservation of every possible amount of hearing is reason enough for avoiding any further destruction in the middle ear, and hence the risk of reinfection of the mastoid seems to be unavoidable till some better means is devised for separating the two cavities.

Case 6. Otitis media purulenta chronica. Recurrent mastoid. Chronic superficial cerebellar abscess. Operation. Brain exploration. Death.

John B., nineteen years of age. Admitted December 30, 1903. Strong, well developed and nourished, of good cólor, a civil engineer. Of a phlegmatic disposition, rather slow, gave the following history:

Right ear has discharged off and on for six years, exacerbations preceded by pain, and once followed by abscess behind the ear, which was opened by family physician without anesthesia. For the last five years has had occasional attacks of severe pain in right ear accompanied by fever, and followed by foul discharge for a day or two. The pain, fever and discharge soon subsided. Was on these occasions treated by family physician, who at times opened the abscess (paracentesis?), followed by syringing.

An attack similar to the above began two and a half weeks ago, except that the accompanying severe headache remained general, *i.e.*, was not confined to the right side. Was able to be up and about the house for a few days, during which the headache was so agonizing that he seemed to spend most of the time with his head bowed, resting on the table. For a

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few days before entrance spent considerable of the time in bed. Two days ago temperature 102°. Pain then became localized at the occiput, radiating to the middle of the back between the scapulæ. One-quarter grain morphia relieved the pain. Three days ago, at 8 P.M., on going to bed was chilly, had some perspiration around the head, but no marked sweating. Took morphia one-eighth grain, 5 A.M. to-day, and this was vomited immediately. It was then given subcutaneously, and repeated at 7 A.M. Vomited again at noon. Was sent then to hospital by Dr. Currie of Cambridge. Has had no dizziness and walked to carriage without support. Admitted at 4.45 P.M., temperature 102°, pulse 100, good volume and tension.

General examination. Lies on his back, legs extended, not restless, knee-jerks normal, no ankle clonus, no Babinsky, no Kernig signs; marked stiffness of neck. Eyes: Movements normal, pupils equal and react to light and accommodation; nose normal; other organs normal; tongue coated.

Local examination. Left ear, membrana tympani thick, otherwise negative. Right ear, a V-shaped scar on mastoid process. No depression, no redness, no edema, no tenderness. External canal reddened at the junction of cartilaginous and osseous portions near membrana tympani; redness and bulging of posterior superior and anterior inferior walls, so that membrana tympani is seen with difficulty. Considerable dry secretion with foul odor wiped away with a cotton applicator, also some blood showing presence of granulations. Blood count was made by house officer, whites 24,000. Ophthalmoscope showed fundi normal.

Operation, 10.30 P.M. Usual mastoid incision exposed rough carious cortex, which was removed with a curette exposing a cavity three-quarters inch deep, three-quarters inch wide, filled with foul cholesteatomatous masses of the consistency of cream cheese and about the same color. The whole of the mastoid was soft from caries and was removed, and a large and free communication was established with the middle ear through the antrum and the aditus. No fistula through the tegmen found, and communication not made. Incision was enlarged one-half inch backwards and upwards, the emissary

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vein exposed and found healthy. The posterior inner cortex of the cavity removed, and the lateral sinus exposed to the bulb; epidural abscess sought with a probe, but not found; sinus wall of dark, opaque yellow color; no pulsations seen nor felt. The wound was irrigated with normal salt solution and packed to await further developments. Patient left the table in good condition. Pulse 90.

December 31. Temperature 100°, pulse 80. Expresses himself as feeling better. Rigidity of the neck same, cannot flex the head. At the visit temperature 99.½ to 100½°. Blood count shows 16,000 whites.

Examination of the eyes shows fundi normal; slight rotary nystagmus observed at 6 P.M., increased by looking upward and outward, more marked to the right. Has pain only occipital, somewhat restless, lies curled up in bed, both knees flexed; cerebration slow.

January 1, 1904. Slightly better and mind more active; prefers to lie on left side with knees flexed. Drooping of upper right eyelid. Slight paresis of external and inferior recti and probably of internal rectus of left. Nystagmus increased on looking upward and backwards over to right. Diplopia. Facial paralysis evidenced by incomplete closure of right eye and less strength of the right side of the mouth. Stiffness of the neck same. Blood count 16,000. Pulse 68 to 80. Temperature 95° to 102°. Fundi slightly hazy at the inner side of the disc. Seen by Dr. Prince, who says either abscess or meningitis.

January 2. Middle of forenoon no change. Wound dressed at 2 P.M. Very foul. Peroxide of hydrogen used. In the afternoon pupils dilated and react. Right larger than left, other eye symptoms and fundi the same. Pulse and temperature are same. Blood count, whites 12,000.

January 3. At 1 and 7 A.M. and 2 P.M. vomited. Had restless night; complained of pain in right eye, which soon disappeared. Drs. W. N. Bullard and Morton Prince called in consultation and advised exploratory operation. The previous wound was opened; considerable cholesteatoma removed. Incision enlarged backward one-half inch, periosteum elevated. Emissary vein cut. Blood stopped by hemo-

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stat. Trephine opening made one inch in diameter behind sinus and below linea temporalis. Button of bone removed. Dura of normal color under slightly increased tension; incised, laid back. Cortex of brain normal. Explored in four directions; downward one inch, backward and inward one and one-half inches each; forward with curved trocar about two and one-half inches. In this direction trocar was not passed further in under advice of neurologist. Mastoid wound enlarged upward upon squamous portion of temporal bone, which was removed with forceps, exposing a large area. Dura and brain apparently healthy, explored with sterile trocar in several directions of varying depth. No pus found anywhere. Dura flaps sutured, and also external wound, except in the first mastoid incision. Returned to bed. Pulse 140.

10 P.M. Pulse improved; four hours after the operation pulse 98, feels well.

January 4. Feels stronger; increasing strength through the day. Pulse 70 to 80, good volume and tension. Temperature 99.2° to 100.4°.

2 P.M. Vomited; cerebration sluggish.

4 P.M. Complains of very severe pain in occiput. Morphia ¼ grain subcutaneously. Afterwards slept very well, respiration 20 to 23. At 8 P.M. temperature 102° and remains so till next morning.

January 5. Temperature 99.4°. Pulse 78, feels well. Pupils equal, normal, no nystagmus, resting quietly. Under primary ether, wound dressed at 2 P.M.; dressing moist, no pus, some oozing of blood from the middle ear, and depth of the mastoid had foul cholesteatomatous odor. Dura and sinus wall in good condition, no change from when first exposed. Some necrosis of skin flap edges. Irrigated and packed with iodoform gauze. Patient was delirious during the next hour, crying with pain in his head. Was given morphia ¼ grain, which was repeated at 7 P.M. Pulse 80 and temperature 101° at 9 P.M.

January 6, 12.30 P.M., rather restless; slightly delirious, yet recognizing people. 9 A.M., could not be aroused. Under homatropin Dr. Bossidy reports optic neuritis in both eyes. From this time gradually failed; became cyanotic

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at 11 P.M., respiration 6 to 8 per minute; pulse very rapid, uncountable; and at 11 P.M. *exitus lethalis*.

Without giving the findings of the Pathological Department in detail, the autopsy showed on the anterior outer surface of the right cerebellum an erosion of the brain or superficial abscess, intra-dural, of about 1 inch in diameter, ⅜ inch to ½ inch in depth. The sinuses made in the exploration by the trocar were not visible, except the long one, which went forward 2½ inches, which was shown as a fine red line with normal brain substance round it. The end of the puncture stopped ⅛ inch before reaching the abscess. It is probable, however, had the abscess been reached, on account of the large amount of brain destruction, and also of the fact that there was no pus under pressure to be removed, and also because the tract for its evacuation would have been so long, that the discovery of the abscess would have made no difference in the condition of the patient.

In this case the abscess was probably latent for a long time, possibly for years. The infection doubtless made its way through the labyrinth.

Case 41. Bullet wound of the right ear, probably self-inflicted. Invasion of the mastoid. Delirium tremens. Removal of bullet. Radical operation, with skin graft. Recovery with a slight amount of hearing.

Michael B., thirty-three, married. Admitted October 20, 1903, to Aural Department. Patient well developed, large, strong, and well nourished. Police officer. Was said to have been shot accidentally at station; while removing his trousers, his revolver fell from his pocket and was discharged. Taken to Relief Station. The region of the right ear was found much discolored by powder, with an ugly ragged wound leading directly inwards. An exploratory operation was made to remove the bullet, but it was not found. This was thirty-one days before admission to the Aural Department. Soon after he was removed to the main hospital, and later an unsuccessful exploratory operation was made to discover the bullet. The patient then went into alcoholic delirium, which lasted two or three weeks. The discharge from the right ear became purulent and very copious; treated by antiseptic irrigations and dressings.

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Examination. Mentally unbalanced, affable, rather loquacious. Region of right ear swollen; auricle swollen and red, evidently dermatitis; considerable swelling and redness, with some edema over mastoid. Partial stenosis of external canal because of swelling of the skin. Pus very copious, and with a clear, serous fluid welling up from canal; wounds of previous explorations firmly and neatly healed.

Examination by probe shows something rough in the external canal, which, on being removed with the forceps, is found to be a small piece of lead. The clear fluid was examined, but found not to be cerebro-spinal, but to contain a high per cent. of albumen. Treated by hot irrigations and compresses to the ear. A few days later, probe found something rough in the canal, movable, and a much larger piece of lead removed with the forceps, the swelling of the canal being somewhat diminished.

October 27. Probe still finds something foreign in the depth of the canal. An incision was made from above and anterior to the insertion of the auricle, running backwards and down to the tip of the mastoid. The periosteum was elevated, extending into the canal till the middle ear was exposed; and there projecting from the bone was a small piece of oxidized lead; forceps showed it to be firmly imbedded. It was sticking out of the hard bone below the round window, above the jugular bulb, forward of the posterior canal wall enclosing the facial nerve, and just backward of the opening of the Eustachian tube. At its entrance it had evidently cracked the bone between the external canal and glenoid fossa, because soon afterwards movement of the jaw was painful, and there was swelling in this region. With fine chisels the very hard bone around this piece of lead was slowly dissected away, some of the posterior canal wall of necessity removed. On account of its close proximity to these vital points it was necessary to be exceedingly careful, and therefore the operation was prolonged; but it was very fortunate that the jugular bulb probably had an abnormally low position, and the carotid canal probably was deep and farther forward than usual. However, after two and one-half hours, a piece of bullet which had mushroomed, and was

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five or six times larger at its inner end than at its presenting part, was extricated. Very slight amount of hemorrhage during the whole of the time of operation. The parts were curetted smooth and the cavity was packed. Up to this time there had been more or less delirium.

November 9. The middle ear has continued to discharge very copiously; canal narrowed; stretched open by tents of cotton wet with boracic acid and alcohol. No more delirium; patient quite rational.

November 25. Following hearing tests made by house officer: Weber, lat. to right. Watch, A. D. o. A. S. $\frac{5}{5}\frac{0}{0}$.

Schwabach A. D.	C	C^{i}	C^{ii}	C^{iii}	C^{iv}
a.	0	5	0	0	0
b.	8	5	7	5	0

A.S.	C	C^{i}	C^{ii}	C^{iii}	C^{iv}
	19	10	7	15	10
	7	5	5	5	5

Was allowed to leave the hospital for a couple of weeks for recuperation, etc., and was treated at the Out-Patient Department. The discharge from the canal and from the persistent mastoid sinus was copious. Readmitted to hospital January 8, 1904.

January 9. Operation. Middle ear, etc., full of granulations; old incision reopened and complete exenteration made, removal of attic contents and throwing all the cavities into one. The hole made by the bullet has filled with granulations; scraped out.

January 17. Thiersch grafts by skin from the leg, covering the whole of the inner cavity. Proper flaps made and posterior wound sutured.

March 7. Two stitches sloughed; discharge profuse from ear, cleansed and treated by the dry method.

March 10. Under cocaine, a couple of stitches put in. On 11th discharged from the hospital.

After this patient was treated occasionally at the Out-Patient Department. November 30 has the following notes:

The wound posteriorly healed. The inner surface of the cavity completely dermatized, except for one small perforation which leads directly inward into the inner wall of the middle ear, evidently the cavity left by the bullet. This has been treated by curetting, caustics, astringents, etc., but probably persists because of slight caries of the walls. It, however,

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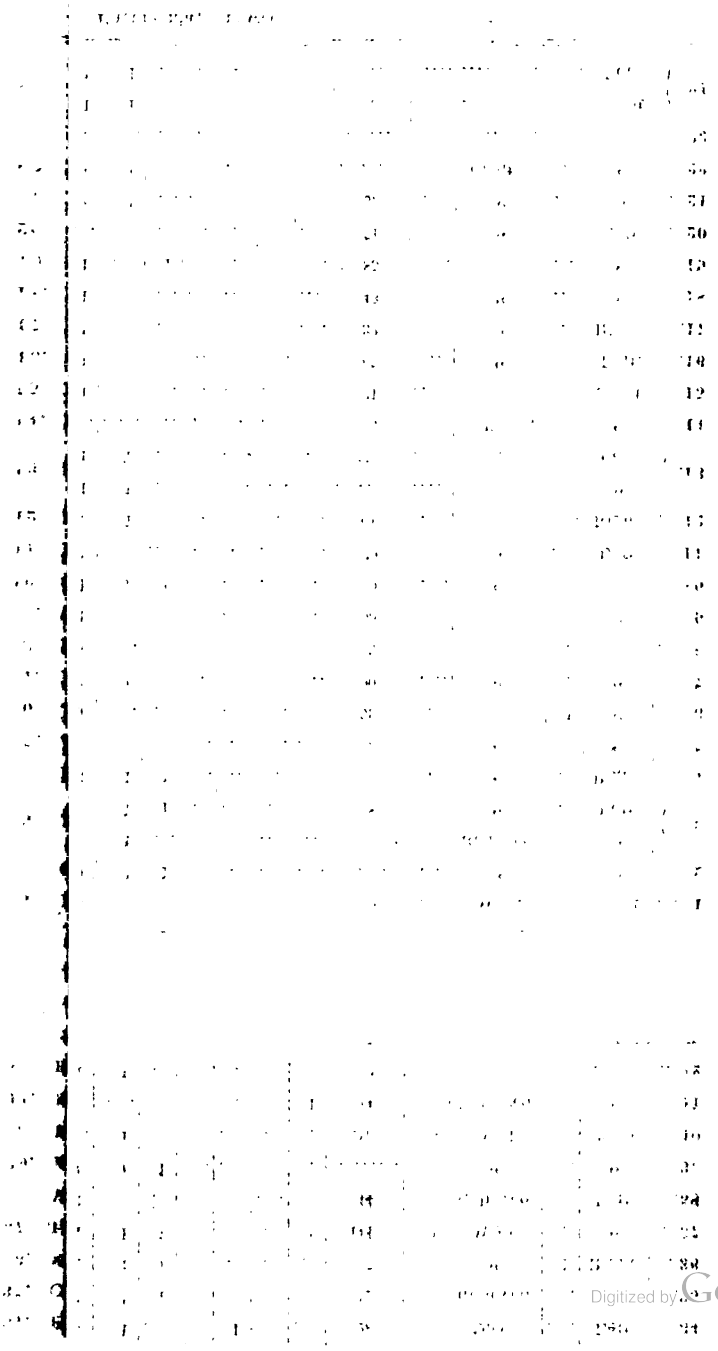
y, 1904, inclusive.



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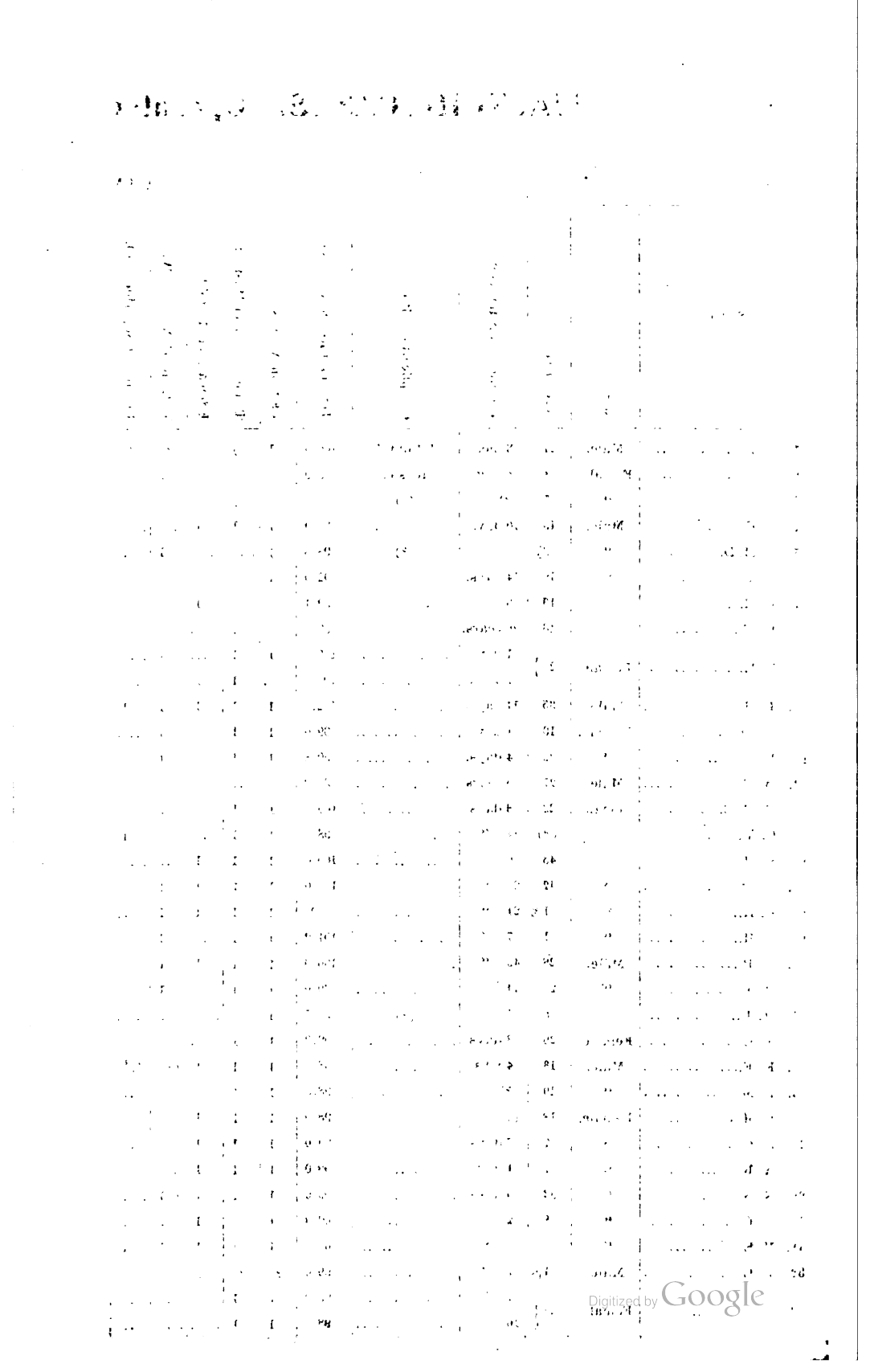
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gives him no annoyance and can be kept comfortable by occasional treatment. The hearing is almost abolished. Cannot hear the voice in the right ear. At long intervals a little buzzing or low whistle tinnitus in that ear; not annoying. Patient somewhat addicted to alcoholic stimulants, is a large eater, and well nourished as stated. Before July had a sudden dizzy fit; fell off a chair while at a game; he fell towards the right side, was unconscious so that did not know what happened. Vomited a great deal afterwards, "probably because of something the physician gave him." He got all over it and has not had a dizzy spell since. The attack was probably not of aural origin.

At this visit hearing tests were as follows: A. D. Rinné negative. Sound of very loud voice faintly heard.

Schwabach A. D. $\frac{\text{a. } 0 \quad 8 \quad 6 \quad 5}{\text{b. } 8 \quad 6 \quad 7 \quad 10}$ Galton's whistle high limit 2.7. C C^{i} C^{iii} C^{iv}

Patient went on in this condition with occasional treatments till about the middle of March, 1905, when late one night his body was found at a patrol box, he probably having succeeded at this time in his attempt at suicide. This was denied by him after the first attempt, but the powder stains and the position of the wound show that the pistol must have exploded nearer than was alleged.

This case is reported as showing the extremely delicate position into which the bullet was driven, almost the only one in that region it could have reached without fatal consequences.

The writer wishes to express gratitude to Drs. H. J. Inglis and W. F. O'Reilly for valuable assistance; and especially to Dr. C. R. C. Borden, who compiled the South Department statistics and performed some of the operations in the contagious wards.

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XXIV.

MALIGNANT DISEASE OF THE LUNGS AND PLEURA.

By Henry Jackson, M.D.

Sarcoma and cancer of the lungs and pleura are not of common occurrence, yet cases are not so rare that a careful consideration of cases at our command seems unadvisable. They may be classified as primary and secondary. It is the first class that offers the greatest difficulty in diagnosis, as cases have been observed in the hospital that closely simulated acute pleurisy or pneumonia. In one which I report there was no suspicion aroused by the history or the signs on entrance that we had not to deal with a simple acute pleurisy of a severe type.

Further, the secondary cases are often of much interest, in that the pleural and pulmonary infection may occur late after the removal of the primary focus, and without any suggestion of a renewal of the primary malignant disease. The cases under my observation have differed essentially in the main from malignant disease situated elsewhere in the body, in the absence of the cachexia so usually found in malignant disease. The presence of a rapidly-growing mass in the thoracic cavity precludes the long continuance of life, as may be seen in cancer of external parts, and on the other hand does not interfere with the proper nutrition of the body, as in cancer of the gastro-intestinal tract. This is evidently one factor that should be especially emphasized, in that it has led to errors in diagnosis in several cases that are recorded. In the cases where the intra-thoracic growth reached proportions sufficient to give rise to symptoms which caused any pulmonary signs, such symptoms were usually of marked severity.

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In other features massive intra-thoracic malignant growths give rise to confusion, in that fever of a high grade is not unusual and leucocytosis is present, both factors that lead one to consider the presence of an acute inflammatory process rather than a new growth of the pleura or lung. The smaller growths, which are so situated as to give rise to symptoms, often give rise to confusion in diagnosis, in that tubercular trouble is considered as probable, especially as in the cases where the growth is small we do not find the leucocytosis usually associated with the massive primary tumors of the lung and pleura.

Case 1. *Primary cancer of the pleura.* Woman, seventy-one years of age, seen in consultation with Dr. R. C. Hurd of Newburyport, July 24, 1903; mild diabetes for several years; during the past winter she had bronchitis, but recovered entirely. In June she went to Newburyport, feeling quite as well as usual. Towards the end of June she did not feel well, but was not especially sick; later there was pain in her left side. Dr. Hurd saw her on July 5 for the first time and found the left chest flat from apex to base. Five pints of clear fluid were removed by aspiration. From July 5 to July 24 she was tapped four times, and at each operation a large amount of fluid was removed.

On July 24, one day after four pints had been removed, I saw her. She could then breathe fairly easily; temperature normal; pulse 84; no edema of the extremities; color somewhat cyanotic; no pallor; there was much nausea and vomiting. In the left chest there was good resonance to the lower third, with respiration unmodified. The heart was somewhat enlarged to the left; soft systolic murmur at the apex. The urine increased in quantity and the vomiting was much less.

On the morning of August 1 she collapsed, and the pulse was 150. At the time of my visit she breathed with much difficulty, being obliged to sit up. Left chest flat from apex to base; no vocal fremitus; no tactile fremitus in left chest. A distant respiratory murmur was heard over the left chest. Five pints of clear fluid with a few red and white cells admixed were withdrawn by siphon. Tapping was required a week later. Her death occurred soon after. Cancer of

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the pleura, with a few small nodules in the lung, was found. No primary source for the cancer was found. The extremely rapid reaccumulation of the fluid caused Dr. Hurd to suspect malignant disease. I was rather inclined to look upon the heart as the cause of the trouble. The urine, though scanty, gave no reason to suspect structural kidney disease. The aspect of the patient was not such as to cause the slightest suspicion of malignant disease.

Case 2. *Primary sarcoma of pleura.* Man, thirty-two, entered the hospital July 28 (Volume 444, p. 170). Family history negative. Previous health not important; habits good. Three weeks before he entered the hospital he took "cold" while driving in a storm. He had chills that night. He had not worked since the onset of the trouble. Cough, with whitish expectoration, soon came on, and dyspnea developed gradually. No chills since first day. On entrance there was marked dyspnea; he was well developed and nourished; cyanotic. The right heart border was just to the left of the right nipple. The left chest was completely flat from the clavicle to the base; tactile fremitus and vocal resonance were absent below the second rib. Two quarts of slightly reddish fluid were removed by aspiration.

August 1. Much better; temperature was lower.

August 2. One pint of fluid similar to first was removed.

August 3. Was aspirated in eighth space where the percussion was flat and fremitus was not obtained. Only a few drops of bloody fluid were obtained.

August 9. Pulse and temperature slowly rising. Dyspnea marked. Physical examination practically as at entrance. He was seen in consultation by Drs. Munro and Sears. As aspiration in two places gave no fluid, a rib was excised by Dr. Munro, and the finger came at once upon a large solid tumor. A bit of the growth was excised, and the tumor was diagnosed as a round cell sarcoma. He failed gradually and died August 12. No autopsy.

During the whole illness the temperature was elevated, during the first few days varying from 102° to 104°, and during the rest of the time from 101° to 102°, occasionally reaching 104°. Pulse 110 to 120. Unfortunately there

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was no blood count recorded. This man was apparently perfectly well until six weeks before death, at which time there developed what appeared to be an acute pleurisy.

A malignant tumor of the pleura was diagnosed when, on August 9, examination of the chest gave evidence, by flatness and total absence of fremitus, of a mass in the pleural cavity. Aspiration showed that this mass was not fluid. This case is a type of the possibility of making the diagnosis of a solid tumor of the pleura by physical examination. After the fluid was removed, the heart, though displaced, was not as far to the right as if there were a large pleural exudate, a factor sometimes of value in the diagnosis of a solid pleural tumor.

Case 3. *Primary carcinoma of lungs.* Woman, forty-four, entered the hospital August 8 (Volume 527, p. 192). Family history negative. Previous history, no serious sickness. Since April in bed on account of varicose veins of the legs. In June was operated upon for a laceration of the cervix. After leaving the hospital she walked about for a few days, and then went to bed on account of varicose veins, accompanied by swelling of the legs. For two weeks has felt worse; headache, vomiting, some cough, with bloody expectoration. There was some pain in the left axillary region. Well developed and nourished. Tongue dry, with a brownish coat; pulse 100; temperature 102°. Above the right clavicle was a small movable mass. Dulness at left apex, with bronchial respiration and increased fremitus; râles heard all through the left lung; leucocytes, 22,000; no bacilli of tuberculosis.

August 11. Widal reported as positive.

August 22. Doing fairly well; temperature and pulse elevated.

September 3. Weak; temperature high; pulse elevated; cough not especially troublesome.

September 12. Marked dulness upper left lung, with increase of vocal and tactile fremitus.

September 16. Phlebitis, both legs.

September 20. Death.

The temperature and pulse were elevated, but irregular all through the illness.

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Autopsy (02.129). Greyish nodules all over the lungs; more frequent over the upper left lobe; occasional large nodules; more lesions on left than on the right. There were similar lesions in liver, spleen and kidney.

In this case again there was no reason to suspect malignant disease, and the pulmonary trouble was looked upon as probably tubercular. The autopsy did not prove the existence of a primary source of infection, so that the case may be considered as one of primary cancer of the lungs. There was no emaciation; no pallor to suggest malignant disease. The finding of the Widal reaction (probably due to some error in technique or observation) made typhoid possible in spite of the leucocytosis.

Case 4. *Primary carcinoma of lungs.* Man, sixty-three, entered the hospital June 2 (Volume 586, p. 248). Family history, mother and one brother died of consumption. Previous history not important, except alcoholic excess in the past. For three months severe burning pain in right chest, constant; pain has increased of late; no hoarseness; no dyspnea. Emotional; senile; fairly well developed; no pallor; slight dulness in right front to third rib; also a small dull area about fourth rib in front; dulness in right back from apex to angle of scapula. Over the dull area there was a diminished broncho-vesicular respiration; few râles at base.

June 6. Temperature irregularly elevated; delirium; much complaint of pain; leucocytes, 75,000; respiration practically absent in right upper chest. Dulness with absent respiration in lower right axilla.

June 10. No change; gradual failure; death.

Autopsy. Right pleural cavity contains 500 c.c. bloody fluid. Right lung contains tumor size of large orange adherent to first, second and third ribs, invading practically whole of the upper lobe. The tumor was cut off from the surrounding lung tissue by a cartilaginous capsule. Central portion of tumor contains cheesy, necrotic material. Similar mass between clavicle and rib, extending into the neck. Inferior lobe shows congestion and edema. Bronchial lymph nodes negative. Small nodule in cortex of right kidney. The character of the tumor was very obscure on

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macroscopic examination, but a microscopic examination showed it to be carcinoma. It was at first thought it might be actinomycosis.

In this case a diagnosis of malignant growth was made, though the enormously high white count made some inflammatory process seem possible. Aneurism was considered as possible, but the great extent of the tumor and the absence of pulsation, proved by X-ray, made such a diagnosis practically impossible. This case may be considered as a type illustrating the absence of cachexia and emaciation, which I have previously referred to as certainly not rare in malignant disease of the thoracic cavity.

These cases are of especial interest in that the disease was primary in the lung or pleural cavity; in two apparently primary in the lung. In two cases the diagnosis was made prior to death; in one case it was suspected, while in the fourth (No. 3) cancer was not suspected.

In the six following cases the pulmonary disease was secondary to malignant trouble known to have preceded the symptoms on account of which the patients entered the hospital. In these the diagnosis was, of course, less difficult and of much less importance.

Case 1. *Secondary sarcoma of lungs.* A man, twenty-five, entered the hospital August 3 (Volume 132, p. 170).

In April he was at the Massachusetts General Hospital for a tumor on both sides of the lower jaw. For two months loss of flesh, soreness across the lower part of the chest, and cough. For three weeks he had noticed enlargement of the chest as a whole.

Physical examination. Pallor, emaciation, tumor of jaw. Heart two inches to the right of sternal border. Some dulness right lung, and later a pleural friction rub in right axilla. Marked protrusion of left chest; lower left back and left axilla flat; tactile fremitus and local resonance much diminished; high pitched respiratory murmur heard below the angle of the scapula. Sixteen ounces bloody fluid withdrawn by aspiration. Leucocytes, 11,600.

August 5. Sixteen ounces fluid withdrawn.

August 6. Aspiration, no fluid.

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August 7. Signs of solidification in left back less marked. Very faint respiratory sound in left front and left axilla.

August 15. A small bit of tissue removed by aspirating needle, which was found to be sarcoma.

August 16. Death.

Autopsy. Thoracic cavity occupied by a large tumor mass which bound together the thoracic viscera. Lungs pushed backward and downward. Left pleural cavity obliterated. In right pleural cavity a litre of bloody fluid and many soft whitish tumors on the pleural surface. Many tumors in both lungs. The main tumor mass evidently arose from the posterior mediastinal lymph glands and measured $22 \times 14 \times 13$ cm. The tumor had pushed the heart forward and to the right. Microscopically the tumor was a round and spindle-celled sarcoma.

The confusion that may arise in physical signs is well exemplified, and also explained in this case. The left pleural cavity was obliterated ten days after one quart of fluid had been removed by aspiration. Further physical signs were obscured by the tumor masses in the lungs and by compression of the lungs by the massive growth of the main tumor in the post-mediastinal space.

The sarcoma was diagnosed before the diagnosis was confirmed by the bit of tumor obtained by aspiration.

Case 2. *Secondary carcinoma of lungs.* Man, fifty-one, entered the hospital March 10 (Volume 480, p. 94).

He had pneumonia eight years before entrance. He had formerly used alcohol to excess; had had gonorrhea and "chancre" with secondary signs. He had not been well for eighteen months; since August increasing weakness with loss of seventy-five pounds in weight; jaundice for three months and a half, swelling of legs and abdomen; for ten days dyspnea.

Physical Examination. Deep jaundice; pallor; emaciation; dulness at right apex to second rib, and posteriorly over right supra-scapular fossa. Also dulness below angle of the scapula, increasing to flatness at the base; dulness below fourth rib in left front. Râles heard over dull areas, especially behind. Tactile fremitus not modified. Liver enlarged

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and nodular; white cells, 5,800. There was no improvement, the dyspnea being a marked feature. Delirium preceded by several days his death on March 24.

Autopsy (00.48). In both lungs numerous small nodules all over the surface, and in the right lung extending into the substance of the lung. Primary adeno-carcinoma of the liver; gallstones; jaundice.

In this case it was evident that the visceral pleura was invaded by the cancer before the lung substance. The white count in this case was especially low, a fact not noted in the other cases.

Case 3. *Secondary carcinoma of lungs.* Woman, forty, admitted to hospital November 8 (Volume 370, p. 148).

She gave a history of a fall five months before entrance; back injured. There had been much pain, and for many weeks she had not been able to walk; loss of twenty pounds in ten weeks; no local signs were demonstrable, and she was for a time on the surgical side, as a movable kidney was found.

December 1 she was again placed on the medical side (Volume 370, p. 211). At this examination there was found harsh respiration all over the chest, with râles at the bases; later hemoptysis; leucocytes, 16,800.

She died January 13, after an accident on December 19, in which her leg was broken.

Autopsy. Whitish nodules found in both pleural cavities; numerous nodules in left lung; nodules in diaphragm, stomach, mesenteric lymph nodes, uterus, ovary and bones.

In this case no diagnosis was made, and there were no signs by which a diagnosis could have been made. The hemoptysis occurred late in life when she was very ill, and might well have been due to some patch of lobular pneumonia.

Case 4. *Secondary sarcoma of lungs.* Man, seventy, entered the hospital April 27 (Volume 110, p. 184).

Well developed and nourished; loss of weight for six or seven months; for four months he had noticed small black tumors on the skin; dulness from angle of scapula downwards in both backs.

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May 1. Diminished bronchial respiration with râles in the right back. Gradual failure without marked pulmonary signs. Death, May 7.

Very numerous tumors all over the body, blackish in color. Throughout the lungs large number of tumors, varying in size from pinhead to 1 cm. in diameter. Infarction in lower right lung. Similar tumor masses in liver, kidney, brain, pancreas and testicle.

In this case the pulmonary lesions gave rise to no symptoms and had no apparent effect upon the duration of life.

Case 5. *Secondary carcinoma of lung.* Woman, forty-six, entered hospital January 28 (Volume B. 262, p. 186).

For nine months a tumor of left breast. The breast was removed February 7.

March 19. Respiration rapid; cough troublesome; severe asthmatic attacks.

April 4. Severe dyspnea; cough. Death. No pulmonary examination is recorded.

Autopsy. Marked pallor; nodule in right breast. Left breast replaced by a large ulcerating area. In the left pleural cavity were several litres of a highly colored fluid. The parietal pericardium and the diaphragmatic pleura were covered with many small tumors. A few nodules in left lung; nodules in liver.

In this case the chief lesions were in the pleural cavity, and death was evidently the result of the cancerous pleurisy with large effusion.

Case 6. *Secondary sarcoma of lung.* Girl, fourteen, entered hospital September 1 (Volume 491, p. 112).

Six months before admission the right leg had been amputated at the hip joint for sarcoma. Three weeks before admission she had pain in the left side, dyspnea and much cough. There was much expectoration streaked with blood; great weakness, but not confined to the bed until admission to the hospital. There had been no cough until three weeks before she came to the hospital.

Physical Examination. Herpes labialis; slight exophthalmos. Left chest flat from apex to base, front and back; no fremitus; respiration bronchial over the upper front with in-

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creased voice sounds. Respiration and vocal fremitus absent below the fourth rib; leucocytes, 19,900. Sixty ounces of bloody fluid were removed by aspiration from the left chest.

September 3. Fair respiration and resonance upper left.

September 13. Breathes easier and is more comfortable.

September 27. Dulness left front; bronchial respiration and bronchial voice sounds with high pitched râles; increased fremitus.

September 29. Much dyspnea. Death.

During the course of the disease the temperature was from 100 to 102°; pulse 130-140.

Autopsy (00.169). Some fluid in left pleural cavity; right pleural cavity obliterated; left lung hard, firm and large rounded nodules noticed in places; much blood in the pulmonary substance. The main part of the right lung was occupied by round nodules very full of blood, small blood sinuses separated by bands of yellow tissue.

In this case is exemplified the great rapidity of the growth of secondary sarcoma in organs richly supplied with blood. Death was the direct result of the sarcoma in the lungs. The pleura was not directly invaded.

There are three cases on record in which there was a metastatic growth in the lungs which gave rise to no symptoms, and no pulmonary signs were discovered.

Case 1. *Primary cancer of the pancreas* with several nodules in the lungs near the pleura.

Case 2. *Colloid cancer of the stomach* with metastases on the pleural surface of the right lung and the diaphragmatic pleura.

Case 3. *Cancer of pancreas;* jaundice; metastases in the liver; cancerous peritonitis with thrombosis of both common iliacs and small tumors on the parietal pleural surface of both lungs.

These three cases point towards the common method of invasion of the lung, namely, by the pleural surface.

Two cases seen in private practice are of interest; in both the diagnosis was obscure.

Woman, sixty-three, seen in August, 1904. Twenty-eight years previously she had an attack of pain in the upper

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abdomen; several years later another attack of pain. Twelve years before several attacks of pain of varying severity. Ten years ago a tumor of the right breast was removed and found to be cancer. In the year 1903–1904 she had lost flesh, had indefinite abdominal pain, but no severe attacks of pain; since the spring of 1904 much nausea and vomiting. The question arose whether the symptoms were due to gall-stones or growth about the gall-bladder of an inflammatory nature, or whether there was a malignant growth. She was not emaciated; she was not suffering acute pain, rather distress and nausea.

The gall-bladder was apparently enlarged, and this, according to the law of Courvoisier, suggested malignant trouble. Further, there was a little dulness in the lower part of the right chest. No pulmonary symptoms.

During the early winter she was fairly comfortable. I saw her again late in January. At this time she had lost much flesh; there was a large lobulated mass in the left side of the abdomen; in the region of the gall-bladder there was an indefinite mass. In the lower right back there was dulness with diminished respiration, without râles; in the right front there was flatness from the third rib to the base without respiration; the heart was not displaced. In spite of the marked signs of involvement of the lung there were no symptoms suggestive of pulmonary disease. In January I think the advice against operation in August was fully justified. She died late in the summer of 1905.

A woman, forty years of age, seen in November. Her mother was said to have had pulmonary tuberculosis in her youth, but was at this time well; one brother died of tuberculosis. In the previous year a tumor of the breast was removed and found to be carcinoma. She had a small uterine tumor believed to be fibroid. Since the preceding April she had a hard cough, spasmodic in character; during the preceding summer the cough continued without expectoration.

Physical examination of the chest was negative in the summer. In September an X-ray examination showed a slight shadow in the upper right chest. Some loss of flesh

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in last six months. Examination of the chest showed slight dulness in the upper right back with diminished respiratory murmur; no râles. She complained of a good deal of pain in the region of the right shoulder.

During the next two months there was a train of symptoms gradually making clear the diagnosis of cerebral tumor, constant headache, vomiting and paresis of single muscles. The pulmonary symptoms were comparatively mild and practically kept in abeyance by the sedatives rendered necessary by the cerebral symptoms. No signs were positive, but the whole course of the disease made the diagnosis of recurrent carcinoma in the lung and brain most probable.

Post-mortem examination showed a large mass involving the posterior mediastinal lymph glands and the bronchial glands. There were numerous small tumors in the lungs and "a little involvement of the pleura which apparently was secondary to that of the lungs." There were also nodules in the kidneys. Liver and other organs free. For many months the possibility of a new growth in the lungs was not suggested.

The above recital of cases shows how latent the existence of malignant intra-thoracic disease may be in certain cases, and also that in other cases the growth may be so rapid as to suggest the possibility of some acute inflammatory disease of the lungs or pleura. I would especially note the absence of cachexia, so usual in malignant disease in the cases where the main lesions are situated in the thoracic cavity.

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XXV.

STUDIES ON THE PNEUMOCOCCUS.

By Charles W. Duval, M.D., and Paul A. Lewis, M.D.
[From the Pathological Laboratory of the Boston City Hospital.]

The work on pneumococcus at the Boston City Hospital, under the auspices of the Commission for the Investigation of Acute Respiratory Diseases of the Department of Health of the City of New York, was begun November 1, 1904, and continued until July 1, 1905. The director of the hospital laboratory, Dr. F. B. Mallory, encouraged us to accept the proposals of the commission, placed the facilities of the laboratory at our disposal, and has maintained a constant interest in the progress of the investigation. The physicians of the hospital's clinical services, both visiting staff and house physicians, have given us every assistance in procuring material. On the part of the commission we have had the support and advice of Dr. Theobald Smith. To all of these gentlemen we extend thanks for their interest in the work and their invaluable assistance.

The purpose of the investigation was to ascertain, so far as possible with the material under our control, the distribution of the pneumococcus, and by a subsequent comparative study of cultures isolated to see if there might be a constant variation in any character, or set of characters, coincident with the source of origin. Our methods and results have recently been published in full, together with the independent reports of the commission's investigators.* It is our present purpose to give an abstract of the complete report, and to review critically certain portions of it in the light of the reports of other workers.

* The Journal of Experimental Medicine, Vol. 7, No. 5, Aug. 25, 1905.

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Except for the method of using the inulin, our technique is a combination of methods previously in use, and well known to investigators who have studied this group of bacteria.

DISTRIBUTION.

I. *Autopsy Material.* — The facts developed by us which concern the general distribution of the pneumococcus, the constancy with which it occurs in the pneumonic lung, its association with other bacteria in the pneumonic lung and its presence in the lungs of persons dying of other causes than acute lobar pneumonia, are presented in the following table:

(*a.*) Cases in which the pneumococcus alone was isolated from the lung:

Acute lobar pneumonia	5 cases.
Acute pericarditis	2 cases.
Acute meningitis	1 case.

The cases of pericarditis and meningitis showed areas of broncho-pneumonia.

(*b.*) Cases in which the pneumococcus was isolated together with the streptococcus:

Acute lobar pneumonia	22 cases.
Wood-alcohol poisoning	1 case.
Chronic interstitial nephritis	1 case.

The cases of poisoning and nephritis showed no lesion of the lung.

(*c.*) Cases in which the pneumococcus was isolated together with (1) streptococcus pyogenes, and (2) pneumobacillus of Friedlander:

Acute lobar pneumonia	4 cases.
Cerebral hemorrhage with broncho-pneumonia .	1 case.

(*d.*) Cases in which the pneumococcus was isolated together with (1) streptococcus pyogenes, (2) staphylococcus aureus and albus, (3) influenza bacillus, (4) pseudo-diphtheria bacillus:

Acute lobar pneumonia	1 case.

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(*e.*) Cases in which the pneumococcus was isolated together with (1) streptococcus pyogenes, (2) pneumo-bacillus of Friedlander, (3) streptococcus mucosus:

Acute lobar pneumonia	1 case.

II. *Surgical Material.* — The results of the examination of surgical material can be summarized briefly.

Pneumococcus present in pure culture:

Alveolar abscess	1 case.
Abscess in groin	1 case.
Abscess in chest	1 case.
Pelvic abscess	1 case.
Septic knee	1 case.
Septic uterus	2 cases.
Acute mastoiditis	2 cases.

Pneumococcus and streptococcus:

Abscess of shoulder	1 case.

The study of pleural exudates deserves special mention. Twenty-five examinations have been made.

Pneumococcus alone	9 cases.
Pneumococcus and streptococcus . . .	6 cases.
Streptococcus alone	10 cases.

It is noteworthy that in the early examinations it was considered sufficient to identify either the pneumococcus or the streptococcus, and no consistent effort was made at any time to grow both the pneumococcus and the streptococcus.

3. *Cerebro-Spinal Fluid.* — From the cerebro-spinal fluid, taken by lumbar puncture from two cases, the pneumococcus was isolated in pure culture. The material was sent from outside the hospital and no subsequent history has been obtained.

4. *Sputum.* — By the plate method the pneumococcus has been isolated from the sputum of several cases of pneumonia.

Examinations of sputa from cases of chronic bronchitis and suspected tuberculosis have shown the presence of the same organism. The pneumococcus was isolated eight times from tubes inoculated for the routine examination for diphtheria bacilli.

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Saliva from the mouths of twenty-four individuals in the laboratory and hospital was examined. These people had never had pneumonia and were in perfect general health at the time of the examination, no account being taken of the slight chronic lesions of the pharynx with which most people in this climate are affected in the winter months. Pneumococci were easily isolated in every instance.

Our studies on the distribution of the pneumococcus have shown that it is to be found practically always at autopsy in the lungs of people dying with lobar pneumonia, and that it is found in the healthy as well as in the diseased portions of the lung. At times this micro-organism is found in the non-pneumonic lungs of persons dying from causes other than pneumonia. Very frequently the pneumococcus is found in purulent affections of the serous cavities and in acute abscesses of other parts. In the mouth and throat of persons in good general health it is found so often that its presence can have no pathological significance.

It is further evident that streptococcus pyogenes and the pneumococcus are found in much the same places and conditions, and very often occur together. The facts of general distribution hardly warrant the supposition that the one bacterium has a closer etiological relation to acute lobar pneumonia than the other.

Our results in this direction are in complete agreement with those reported by the other recent investigators. They differ from those obtained by earlier workers in the field in showing that the pneumococcus is much more widely distributed than was supposed. Recent improvements in the technical methods of isolation and identification account for this discrepancy in result. All work on the bacteriology of the lung at autopsy, including that of the present investigation, loses much of its significance in view of the work of Norris and Pappenheimer, who demonstrate that the necessary handling of the body between the ward and autopsy table usually suffices to fill the air passages of the lung with material from the throat and mouth, which disturbs entirely the subsequent bacteriological lung examination.

In attempting to draw distinctions between pneumococci

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of various sources we have met with no success. We have paid most attention to cultural features. The fermentation of the inulin characterizes a definite group of pneumococci. Inulin-splitting pneumococci are found with frequency among those cultivated from all sources. We have found no other cultural feature which is more distinctive.

We have also been unsuccessful in demonstrating constant differences in virulence between cultures isolated from various sources. Our work in this direction has been neither extensive nor accurate enough to warrant positive conclusions. However, no one has conclusively demonstrated constant differences, either in virulence or cultural features, between the pneumococcus of the throat and mouth and that isolated from diseased tissues. Probably the most that can be hoped for at present is the separation of a rather indefinite group of pneumococci having more active pathogenic characters than those usually found.

THE ACTION OF PNEUMOCOCCI ON INULIN.

Early in the year we placed great reliance on the inulin test as an absolute means of differentiating the pneumococcus from streptococcus pyogenes. We used then the serum-water-inulin medium proposed by Hiss. Except for one lot of inulin-serum-water medium we have had nothing but failure in its use. This failure we have been unable to explain satisfactorily. We do not feel convinced that the medium is essentially faulty, but there has been perhaps some disturbing factor in our material or method of preparation which we have not been able to discover or control. We have, however, had no trouble in obtaining constant results with the pneumococcus in serum-water media containing other carbohydrates.

In the hope of avoiding the difficulties encountered in the use of the inulin-serum-water medium, at the suggestion of Dr. Theobald Smith we undertook a series of experiments with inulin in bouillon. The outcome exceeded our expectations. The results of successive titrations remained uniform, and we can recommend this modification of the inulin

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test for routine work. Using these results as a basis, pneumococci can be classified as follows:

A. Inulin fermenters { I. High acid producers. II. Medium acid producers. III. Low acid producers.

GROUP A. = Inulin Fermented.

TYPE.	Culture Number.	TOTAL ACIDITY. BOUILLON. Plain.	Inulin Lot I.	Inulin Lot II.	Average.	REMARKS. (Uninoculated Controls Titrate at 0.6 to 0.8 per cent.)
		Per Cent.	Per Cent	Per Cent.	Per Cent.	
I. High Acid Producers	C.D. 16	1.1	6.5	6.8	6.57	These cultures ferment mannit.
	C.D. 12	1.0	6.6	6.4		
II. Medium Acid Producers	C.D. 9	.9	4.3	4.3	4.53	The cultures of this type and also of Type I. are distinguished from Type III. and the non-fermenters by the fact that they produce a diffuse cloud and heavy sediment in the bouillon, recognizable in from 16 to 24 hours.
	C.D. 19	1.0	4.3	4.2		
	C.D. 20	1.1	4.2	4.6		
	C.D. 21	1.0	4.9	5.0		
	C.D. 22	.9	4.5	4.8		
	C.D. 23	.9	4.5	4.6		
	C.D. 24	1.1	4.8	4.5		
III. Low Acid Producers	C.D. 1	1.0	2.6	2.6	2.6	These cultures are also to be distinguished from the non-fermenters by a slight diffuse clouding of the bouillon which is marked on the second day of cultivation.
	C.D. 2	1.1	2.3	2.7		
	C.D. 4	1.1	2.8	2.3		
	C.D. 6	1.2	2.6	2.4		
	C.D. 8	.9	3.3	2.2		
	C.D. 16	1.0	2.6	2.7		
	C.D. 18	1.1	3.3	2.6		
	C.D. 25	.9	2.0	1.9		
	C.D. 26	1.1	3.0	3.1		

GROUP B. = Inulin not Fermented.

		Per Cent.	Per Cent.	Per Cent	Per Cent.	
IV.	C.D. 7	.9	1.4	1.5	1.65	These cultures have been fully identified. This group could be greatly enlarged, but cultures might be introduced that could not be certainly differentiated from streptococcus pyogenes.
	C.D. 27	.8	1.6	1.4		
	C.D. 14	1.0	1.1	1.5		
	C.D. 28	1.1	1.6	1.7		
	C.D. 29	.9	1.7	1.2		
	C.D. 13	1.0	1.4	1.3		

NOTE. — Streptococcus pyogenes cultures titrate up to 1.6 per cent. acid.

B. Inulin non-fermenters.

Bouillon is made according to standard methods from beef. It is reduced in acidity to from .2 to .4 per cent. normal to phenolphthalein. Subsequent sterilization restores the acid-

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ity to from .5 to .8 per cent. Carefully cleaned tubes containing nine c.c. of bouillon are sterilized. A 10 per cent. solution of inulin in distilled water is sterilized in the autoclave at fifteen pounds pressure for fifteen minutes, and with a sterile pipette one c.c. of the inulin solution is added to each tube of bouillon.

The tubes are simultaneously inoculated with the cultures to be tested, incubated from the period of the experiment, and then titrated for percentage acidity, using the same solution and indicator. Theoretically it might be better to prepare sugar-free bouillon as a culture base. It has proved satisfactory, however, to use as control cultures in bouillon containing no inulin.

The table shows the result of titrations in two lots of inulin bouillon made from different material and different brands of inulin. The period of growth in this experiment is one week. With a little experience the high and medium acid-producing organisms can be distinguished in twenty-four hours, and the low acid-producing organisms in forty-eight hours, although the numerical differences at these periods are small and inconstant. It is probable that if the number of cultures worked with were doubled or tripled, organisms intermediate between these groups and types might be found, but the types are sufficiently marked to illustrate the efficiency of the method employed. With two or three exceptions, all of our inulin-fermenting organisms that have survived prolonged cultivation appear in the table. The non-inulin-fermenting group might be greatly enlarged by the addition of about thirty cultures, which we still retain. As the differentiation of many of these cultures from streptococcus pyogenes is difficult and uncertain, we prefer to test only those whose identity rests on secure ground. By comparison of the figures given for the plain bouillon controls with those given for the members of Type IV., it is seen that the average of the latter is somewhat higher. This is probably due to the presence of small quantities of fermentable impurities in the inulin. Inspection of the titrations with this group shows that the method gives no aid in the identification of these cultures. The cultures included in

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the table, judged by all of their characters, are, without doubt, pneumococci. We believe, however, that some cultures which, according to the titration with inulin bouillon, belong in this group are typical streptococci. It is not our purpose, at present, to classify the cultures of this group.

Since the introduction of inulin has made the identification of some groups of pneumococci relatively easy, the difficulties previously encountered in distinguishing this organism from streptococcus pyogenes are significant only in the non-inulin-fermenting group. The cultures which ferment inulin, and a few of those which do not, have the pneumococcus characters so well developed, and preserve them so constantly in culture, that their identification by means formerly available is not very difficult. On the other hand, it is probable that careful study of the non-fermenting group will establish intermediary varieties and may render unavoidable the conclusion that the pneumococcus and the streptococcus are races of a single species of bacterium. That the pneumococcus and streptococcus are not the extreme types of such a species seems probable, if one takes into consideration the saprophytic streptococcus on the one hand and such cultures as the encapsulated diplococcus, of which we will give an account, on the other. There may also be races which have been separated even farther from the usual types.

Our conclusions with regard to the inulin test are as follows:

I. The routine isolation of the pneumococcus is much facilitated by this test. Until the number and pathological significance of the non-inulin-fermenting group of pneumococci is established, the test must be carefully controlled by the older methods of identification.

II. A final opinion as to the best method of using the inulin cannot be offered. We believe, however, that the inulin-bouillon method by mere inspection is as easy to carry out and as accurate as the serum-water method, and that with careful titrations it is more delicate, as it offers a means of subdividing the inulin-fermenting pneumococci into definite groups — a differentiation impossible by the latter.

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STREPTOCOCCUS MUCOSUS.

In the course of the investigation we have twice encountered a Gram-staining, encapsulated diplococcus with characteristics which made it peculiarly interesting. We have identified it with the diplococcus described by Richardson, and by comparison of cultures with the coccus described by Howard and Perkins. We have noted some points in its morphology, cultural features, and pathogenicity which do not appear in their descriptions. Those who first described this micrococcus considered it to be a variety of streptococcus. It is commented on in more or less detail in all of the commission reports, and is generally considered to be much more like the pneumococcus than like streptococcus pyogenes. We are in agreement with those who class it as a variety of pneumococcus.

SUMMARY.

That the pneumococcus is present post-mortem in the lungs of all persons dying of acute lobar pneumonia has long been known, as well as the fact that it is frequently present in the throats of healthy people. The work of the year has confirmed these views, and has shown that this microorganism is much more generally present in normal throats than was supposed. In view of the probability of post-mortem insufflation and ante-mortem aspiration of organisms from the throat and mouth, it is doubtful if the mere presence of any species of bacterium in the lung at the time of autopsy has the significance frequently attributed to it.

The results attained by the use of the titration method of testing the power of pneumococci to ferment inulin are but a beginning. They suffice to show the superior accuracy of a technique which should come into general usage. In the general report there are new points of bacteriological interest, and technical advances have been made which will aid in the solution of the difficult pathological and bacteriological problem presented by pneumonia.

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XXVI.

OPERATIVE TREATMENT OF OLD FRACTURES AT LOWER END OF RADIUS.

By Howard A. Lothrop, M.D.

Fractures at the lower end of the radius are extremely common. The exact lines and location of the fracture vary much with consequent degrees of deformity and of subsequent disability. In a loose way, without conveying any degree of accuracy as to the lesion, the term "Colles' fracture" is applied to most fractures in the lower one and one-half inches of the radius.

Pathology.— Lesions at the lower end of the radius may be grouped as follows:

1. Separation of epiphysis. In children the line of fracture is usually between the radial diaphysis and epiphysis. Often, however, the epiphysis has attached to it a fragment from the posterior portion of the lower end of the diaphysis (case 9). This lesion produces a characteristic deformity, practically similar to that of group three.

2. Fissures. Small fragments of bone. As a result of falls on the outstretched palm, it happens not infrequently that small fragments of bone break off from the circumference of the lower articular surface of the radius, or that fissures extend upward for a short distance. In these cases, except for subsequent swelling of soft parts and discoloration, the symptoms are chiefly subjective -- pain and tenderness. There is no bony deformity upon which to base a diagnosis, but a suspicion of fracture may be verified by an X-ray examination.

3. The common fracture at the lower end of the radius is a more or less transverse fracture situated one-half to one

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inch above the styloid process, the plane of fracture extending from before backward and upward. The lower fragment, therefore, is a distinct mass which usually includes the whole articular surface, both carpal and ulnar. Its displacement is one chiefly of degree. It may be so slight as to escape detection, but this is unusual. It is displaced, to a certain degree at least, in three directions, viz.: Backward, upward and outward. Upon the degree of each will depend the resulting deformity. A certain amount of rotation of this fragment is common.

If there is much displacement there is invariably injury to ligaments. The radio-carpal ligaments remain intact. The injured ligaments are those about the lower end of the ulna, viz.: The triangular ligament (between radius and ulna), the anterior and posterior, radio-ulnar and ulno-carpal ligaments. The new position of the lower end of ulnar is due to the displacement of the radial fragment and the rupture of some of the ligaments mentioned. Further detail is not called for here.

Forward displacement of the lower fragment is uncommon. In such a case the exact position of the fragment would be discovered by X-ray, and if a neglected case with faulty union presented, correction by osteotomy could be accomplished as in cases with backward displacement.

4. As bony complications of radial fractures, one must bear in mind lesions of the ulnar styloid and lower end of ulna and fracture of the scaphoid.

Before attempting to correct mal-union of radial fractures in cases neglected or otherwise, the exact bony lesion must be determined by means of X-ray photographs taken in two planes — antero-posterior and lateral.

Disability. — Except in the aged and under unusual circumstances, most radial fractures are recovered from with practically perfect function for ordinary purposes, but it is unusual to obtain a perfect position of fragments in cases where there has been displacement. The restoration of the lower end of ulna to its normal relation is the part of reduction that most often fails. Many cases recover with good function, but with marked deformity, and, on the other hand,

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the appearance at the wrist may be satisfactory and yet the function be poor. Hence, various factors may contribute to a degree of more or less permanent disability.

The following conditions may interfere with complete restoration of function: Deformity. The fragments may press on tendons; their altered position gives a new adjustment of articular surfaces, and this, together with the displacement, interferes with motion. Pain restricts motion, due chiefly to displacement of fragments with nerve pressure. Adhesion between tendons and their sheaths is not uncommon. Deformity may persist with equal frequency in all cases; this is the commonest cause of persisting disability in children and young adults. The power of repair and adaptation is greatest at this period. In later adult life and in the aged, the chief factors against good recovery of function are the tendency to form adhesions and the persisting chronic inflammation between joint and tendon surfaces, all of which may be aggravated by mal-position.

Treatment. — The general indications for treatment of radial fractures are the same as for fractures elsewhere, viz.: 1, complete early reduction; 2, fixation until the repair is strong enough so that the fragments do not become displaced subsequently. Massage, baking, immersion in hot water and other similar procedures are often of great value in hastening the restoration of function. If the surgeon has carried out all of these measures, he has done all that can be done for the patient. The importance of immediate complete reduction under an anesthetic cannot be too much emphasized; otherwise, the case is started wrong and ever afterward all efforts are handicapped.

As to the mode and length of time of fixation, there is much divergence of opinion. I cannot agree with some surgeons, who claim that reduction is all that is required and are satisfied to apply a simple roller bandage, which holds a pad at the front of the wrist. I grant that with a careful patient a good result may be obtained thus, but it is not a safe method with average skill and in the ordinary case. Usually the tendency to some displacement is considerable, and this tendency must be resisted.

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As to apparatus, there are many types of splints and other fixation contrivances, some of which are better than others. A man skilled in the treatment of fractures could obtain a good result with most of them. The apparatus to advise,

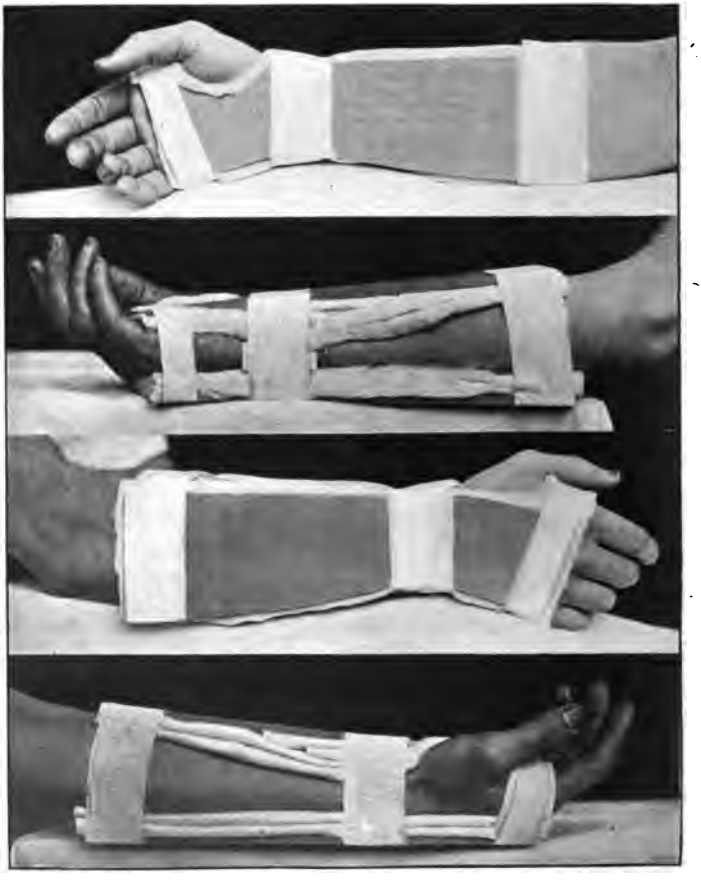

FIGURE 1.

however, is the one that would be the safest and would give the best results when applied by those possessing average skill. The surgeon may select a splint already made for either the front or back of the forearm, or he can shape a splint for himself out of splint-wood. Some prefer plaster of Paris. More skill is required in the use of the latter, and it is not

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to be advised in the routine treatment of these cases. Personally, I am in favor of the anterior and posterior splints made out of splint-wood for each case. (See Fig. 1.)

The object of this paper is, in particular, the treatment of old cases of fracture at the lower end of the radius where the result is unsatisfactory either because of marked deformity or poor function, or both. Such cases are numerous.

Ordinarily there is no excuse for a marked degree of deformity if the case is seen early and the patient has submitted to the treatment advised. For reasons other than that of deformity there may be unavoidable poor function. The latter is so often dependent upon the former that subsequent effort for restoration of position is frequently justifiable. Restoration may be attempted in different ways, according to the age of the fracture. For the first three to four weeks the fragments may be readjusted by manipulation with patient under an anesthetic. If this fails it is unwise to resort to the mallet, wrench or other mechanical device, for their use is crude, and subjects the soft parts to unnecessary and harmful violence. The force is not properly directed, and often an additional fracture results. Ordinarily after the fourth week the site of fracture should be exposed and an osteotomy performed at precisely the point of fracture, and the fragment restored to its original position. We have then the treatment of a recent fracture. For at least thirty years operative attempts have been made to correct cases of mal-union.

Indications for Interference. — In general, most cases of mal-position should be corrected if seen before the expiration of the third or fourth week. After that time each case must be decided for itself, and the choice of operation will be an osteotomy. One can offer excellent hope of correcting the deformity and be reasonably sure of improved function without much risk of making the wrist less useful. The younger the patient the better the prospect of good function, but age is not a factor so far as concerns the restoration of fragments. Only in selected cases would it be wise to do an osteotomy in patients over fifty-five years of age.

Technic. — The following technic has been carried out in

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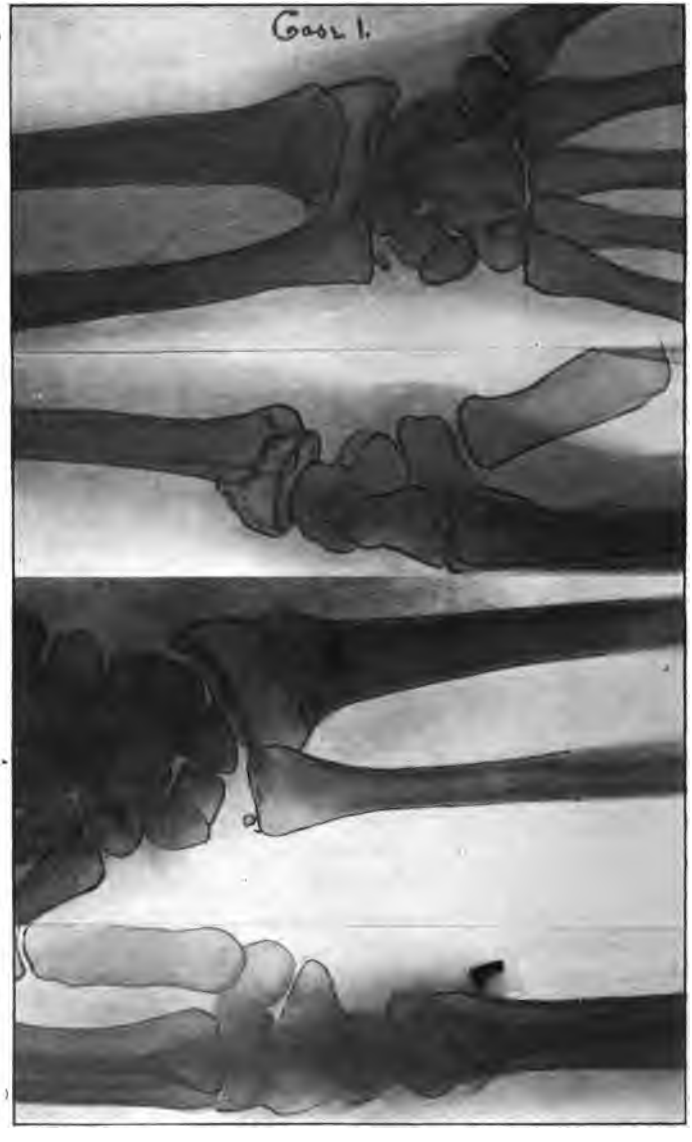
the cases reported: Accurate understanding of the displacement; ether anesthesia; careful preparation of the skin



of forearm and hand; the hand covered with a sterile rubber glove; a tourniquet applied over a folded towel above the elbow. It would be wise to operate without a tourniquet

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on account of nerve pressure, but it is important to have the field of operation dry, so that every step can be performed with precision. With practice the tourniquet may be dispensed with. Rest the forearm, the hand of which is held semi-pronated by an assistant, on a table. Make an incision on the external surface of the wrist about 1½ to 2 inches long, the center of which is over the fracture. A radial vein may be encountered, which may be ligated or drawn to one side. Expose the tendons of the extensor brevis pollicis and supinator longus muscles. Approach the line of fracture in front of and behind these tendons without disturbing them much. No other tendons need be encountered or, at least, disturbed much. Expose the fracture, using small periosteum elevators, for which small, sharp curettes are excellent. Keep close to bone and expose the line of fracture for the full width of the radius front and back reaching nearly to the radio-ulna articulation. This is done with the elevators pushing the soft parts away from the bone without opening any tendon sheaths. The soft parts are held away by long narrow retractors. By means of a small bone drill numerous perforations are made in the line of union so as almost to sever the lower fragment. The separation is then nearly completed by means of small chisels. The retractors guard the soft parts against injury. Now for the first time gentle force is used so as to entirely free the lower fragment. Without the least difficulty it will be possible now in all cases to correct the backward and upward displacement. Sometimes the position is more satisfactory if the projecting anterior border of the lower end of the upper fragment is trimmed with narrow-bladed rongeur forceps. If the fracture is operated before the expiration of the fifth week all the deformity may be corrected satisfactorily, and in all cases, no matter how old, the backward displacement can be overcome. If, however, the shortening be great and the lesion chronic — say more than five to six weeks old — it is often impossible to restore the relative position of the lower end of the ulna. This is chiefly because of the readjustment of the soft parts which are held by new and strong connective tissue. It

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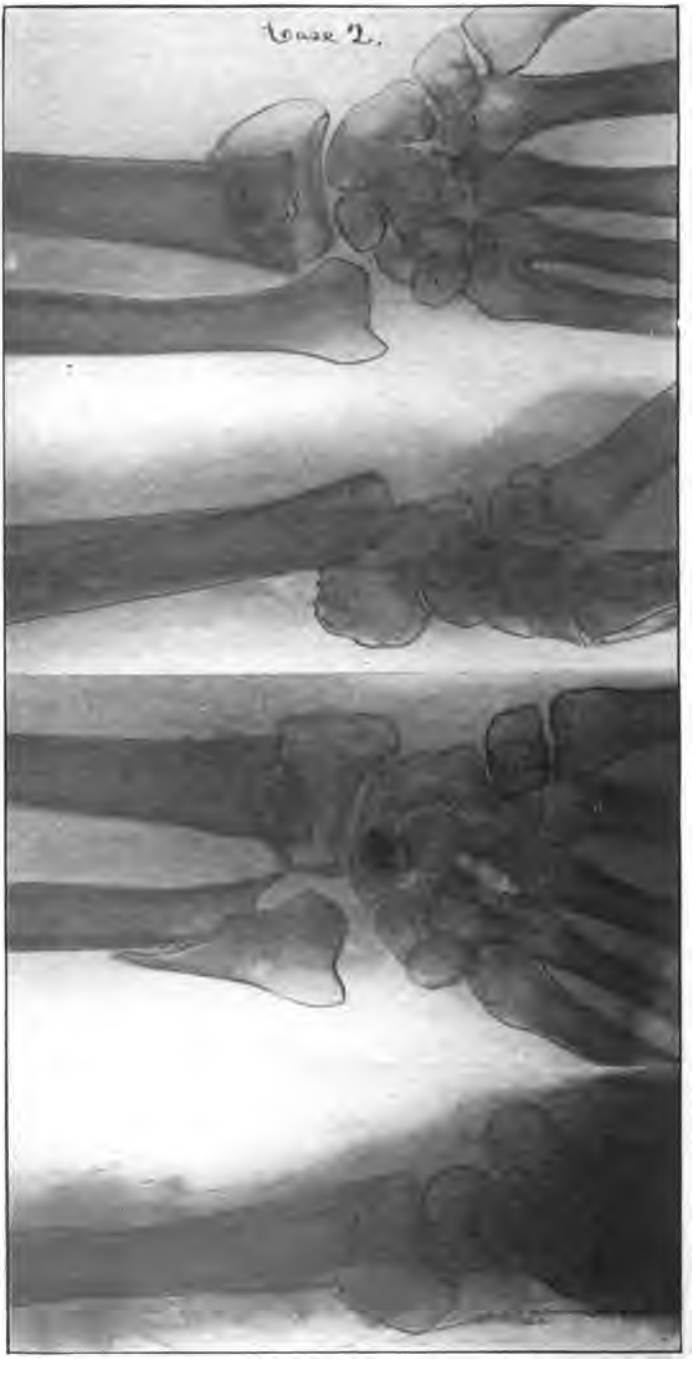

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does not seem wise to use undue force to try to stretch this, and there is nothing which can be severed with the knife. Hence, the lower end of the ulna still remains unduly prominent. This prominence can now be made to disappear satisfactorily by shortening the ulna. To accomplish this some operators have resected the head of the ulna. This would seem objectionable, because it opens the wrist and radio-ulna articulations. Such resection would seem to me to be indicated only in very chronic cases where there was uuusual shortening of the radius, so that the head of the ulna approached the lower row of carpal bones. The object of shortening the ulna is to avoid too great tendency of separation of the restored radial fragments when the styloid processes are held in proper relation and to avoid the unsightly prominence of the ulna head. A resection of a portion of the shaft of the ulna is the better method, and it will generally accomplish the desired end. I am uncertain as to the best place for resecting, but should favor a point as close to the head as possible without opening the radio-ulna joint. This is accomplished through a one-inch incision over the ulna side of the bone. The bone is subcutaneous here, and no sheaths need be opened. Free the circumference of bone by means of small periosteum elevators. Apply a chain saw and remove a circular button of bone, in thickness according to the requirement. The ends of bone should be drilled and held in apposition by some suture material, preferably chromicized catgut or wire. The incision or incisions may now be closed and the tourniquet removed before or after the application of the splints.

From this point we have to deal with what amounts to a fresh fracture, and such principles should be followed as would be required to restore and maintain the parts in a correct position. This is comparatively easy to control. The dressing must be applied evenly and the splints padded correctly.

On the day following operation X-ray photographs should be taken in two planes, and these may show that some readjustment of position is necessary. A dressing should be done in two to four days, after which the padding and adjustment should not be disturbed. Some kind of fixation

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should be continued until union is firm enough to resist any tendency to displacement. As a rule the last splint should be continued four weeks.

The splints preferred by the writer are the shaped pieces of splint-wood which extend from the bend of the elbow to the metacarpo-phalangeal articulation, possessing a moderate

bend at the wrist joint so as to keep the hand a little adducted. (See plate.) Both splints have even layers of sheet-wadding. A pad is placed on the anterior splint between the wadding and splint corresponding to the anterior concavity of the forearm near the wrist, its lower end coming only as far as the line of fracture. The anterior splint may be cut out so as to allow for the thenar eminence. No extra padding is called for necessarily in connection with the posterior

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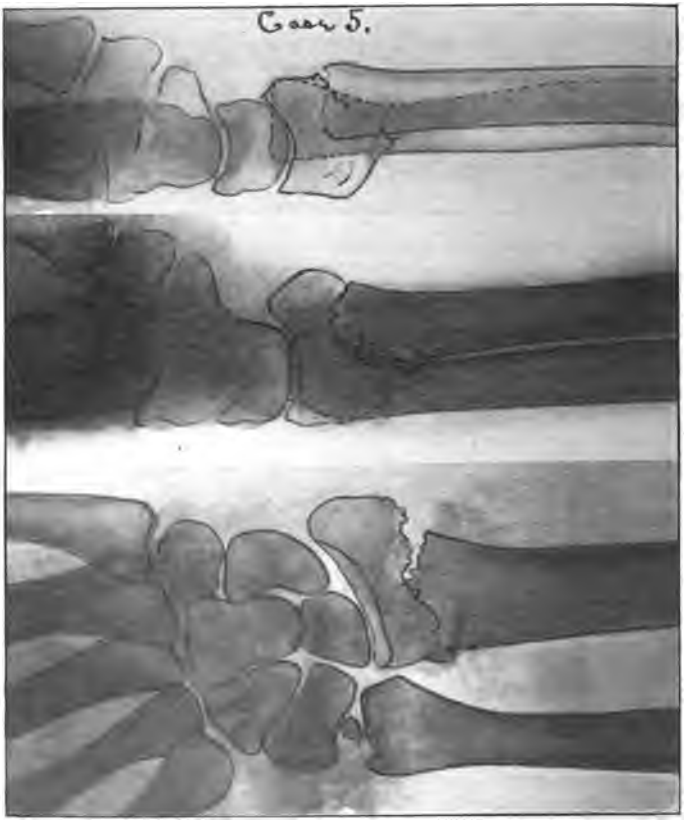
splint. If a pad is needed it is for the purpose of resisting the backward tendency of the lower radial fragment, and it should be placed opposite this fragment between the splint and its padding. The arm is held semipronated, *i.e.*, thumb uppermost, thus allowing the greatest separation of the radius and ulna, and the splints placed with planes parallel



to each other and to the plane of the forearm bones. The whole is supported by a sling. The patient can be up and about after the first day. From time to time passive motion should be made at the wrist, and the patient encouraged to move the fingers after the first few days. The anterior splint may be removed in three weeks and the posterior one in four weeks, although judgment must be exercised in indi-

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vidual cases. Finally, massage, immersion in hot water, etc., hasten restoration of function.

The following cases illustrate the subject at hand. Some were private and others hospital patients, and for the privilege of operating upon the latter I am indebted to my colleagues:

*Case No. 1.** — Woman, thirty-seven years. Patient was thrown from a carriage, sustaining a left Colles' fracture, scalp wounds and concussion of the brain. She suffered much from the head injury for two weeks. The fracture was recognized at time of injury, but was, in a measure, neglected on account of the severer injuries. Patient was referred to me nine weeks after accident. She was in fair general health, but neurasthenic. Local: The left wrist showed much antero-posterior deformity, but practically no adduction or abduction of the hand. The line of fracture was transverse and about one-half inch above the lower extremity of radius; the displacement of the lower fragment was chiefly backward. The prominence normal for the head of the ulna had disappeared. Union was firm. All motions at wrist were greatly limited and rotation was almost absent. There was considerable pain at head of ulna.

Tourniquet. Incision 3 cm. on outside of radius over point of fracture. Lower fragment made free in the manner described, little difficulty being experienced. The deformity disappeared at once. Wound closed with a buried subcutaneous suture. Position easily maintained with anterior and posterior pieces of splint-wood, leaving fingers free. Wound healed by first intention. Splints removed in three weeks. There was considerable stiffness at the wrist. This was overcome by persistent massage. At the end of five months all motions at the wrist were normal. No perceptible deformity persisted.

Case No. 2. — Laborer, forty years old. Fourteen weeks ago patient sustained a Colles' fracture. Although treated at once the end result was very unsatisfactory. The degree of deformity was excessive, and the impairment of function was such that he could not attend to his ordinary laboring work. The lower fragment was displaced backward, upward and outward to an unusual degree, as shown by the X-ray.

The usual incision was made over the fracture at the outer side of radius. With only moderate difficulty the lower fragment was separated. When, however, this was free, it was impossible to overcome the unusual prominence of the head of the ulna. This was due in a measure to the contraction of the soft parts and the proliferation of connective tissue. Through the same incision an osteotome was introduced between the radial fragments, by means of which an osteotomy was done on the ulna. When the ulna fracture was complete, the wrist deformity disappeared at once. The wound healed without suppuration. The external appearance of the wrist was good. The radial styloid was lowest and the head of the ulna and the ulnar styloid were

* See X-ray photographs of each case. These represent the condition before and after operation.

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not unduly prominent. There was a little widening of the wrist. The X-ray shows the ulnar osteotomy was very oblique, and it appears as though the lower sharp end of ulna were in contact with the lower fragment of radius. This condition did not interfere with rotation. Originally the backward displacement of the lower radial fragment was very marked; finally, it was only a little backward. The result was a practical correction of the deformity and much improvement in function.

Case No. 3. — Man, fifty-seven years. Four and one-half weeks ago patient fell, sustaining a right Colles' fracture. Treatment neglected. General condition of patient good. Local: Unusually prominent silver-fork deformity. All motions much restricted; grasp very weak. Patient unable to use right hand to any great extent, both on account of restricted motion at wrist and on account of pain. Clinical and X-ray examination showed that the displacement of the lower radial fragment was chiefly backward; the lateral and upward displacements were moderate. Union was too firm to be broken up by manipulation.

A single incision was made over site of fracture on outer side of radius and the line of fracture exposed. By means of drill holes and small chisels the lower fragment was freed. With moderate force the normal position was almost restored. Healing by first intention and union firm in five weeks. Function practically complete in six months. Deformity scarcely perceptible.

Case No. 4. — Woman, thirty-nine years. Four weeks ago fell on ice, sustaining a left Colles' fracture. Injury was followed by pain and swelling, but she thought it was only a sprain and had no medical attendance. At time of entrance to City Hospital there was a characteristic silver-fork deformity. Patient complained of stiffness, pain at wrist and inability to adduct the hand. X-ray examination showed that the chief displacement of the lower fragment was outward; there was some backward displacement, but really no appreciable degree of shortening as shown by the persisting normal relation of the two styloid processes.

The usual one and one-half inch radial incision was made, exposing the line of fracture. By means of bone drills and small chisels the radius was refractured at the line of union and the fragments were easily restored to their normal position. Healing by first intention; splints four weeks; union firm in five weeks. Deformity corrected, function excellent.

Case No. 5. — Woman, thirty-nine years. Seven weeks ago patient fell on an icy sidewalk, sustaining a left Colles' fracture. Injury was followed by medical treatment, but the deformity was not corrected. Backward displacement persisted to a marked degree. Firm union and fair function were obtained. Supination was greatly limited.

The line of fracture was approached from the radial side as usual and the lower fragment freed at the line of union. Numerous bands of fibrous connective tissue corresponding to periosteum were severed. Considerable prying of lower fragment was necessary to restore its position. The X-ray shows a satisfactory final restoration of the radial fragment. It will be observed that the ulnar styloid was broken, but that the radial styloid is the lowest, thus establishing their normal relation. Some separation of the outer portion of the radial fragments

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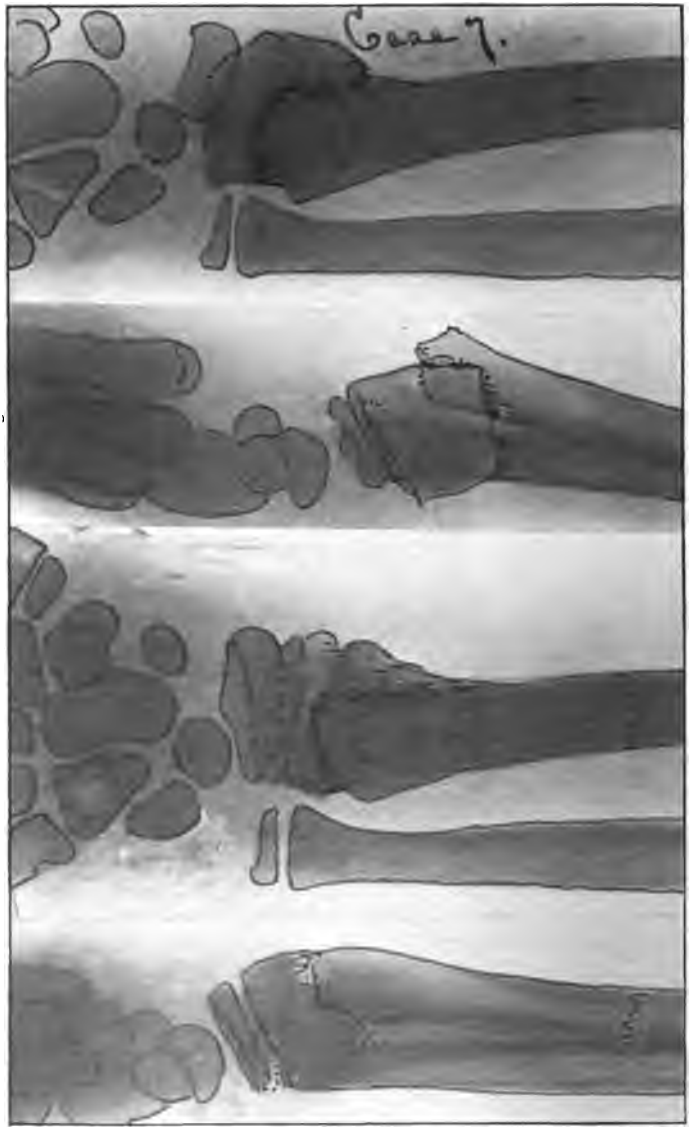
persisted, but there was sufficient area of contact for union to become firm in five weeks and the position continued unchanged. The final result was satisfactory in all respects.



Case No. 6. — Man, forty-two years, machinist. Ten months ago patient sustained a Colles' fracture of the right radius. Notwithstanding medical treatment a greatly deformed wrist persisted. Union was firm, but the arm was very weak. Because of the appearance and the

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weakness patient desired that an effort be made to improve these conditions. The original deformity is shown by the X-ray.

The radial incision was made and the lower radial fragment freed. Although this lower fragment was perfectly movable it could not be drawn down so as to restore the length of the bone or obliterate the marked prominence of the lower end of the ulna. This was because of the resistance of the soft parts. Hence a second incision, one inch long, was made over the lower portion of the ulna on the internal side of the wrist. A circular button of bone, one-third of an inch long, was removed from the ulna by means of a saw and the fragments of ulna held in apposition by a wire suture.

The wounds healed by first intention. The fracture in the radius was firm in four weeks. The union between the ulnar fragments was delayed and did not become firm for eight weeks. All splints were removed in five weeks, and for four weeks longer patient wore a leather wristband, the pressure of which was controlled by a buckle.

Eventually the union was complete without noticeable deformity. At the end of six months all motions were completely restored and the strength of the arm was satisfactory to the patient.

Case No. 7. — Boy, ten years. Operated by Dr. H. L. Burrell, at The Children's Hospital, to whom I am indebted for the privilege of including this case. Two months ago patient fell with fracture of left radius near the line of epiphysis and diaphysis. He had immediate treatment by a physician, and it was thought the fracture was reduced. At entrance examination showed a very marked silver-fork deformity. X-ray showed marked lateral, backward, and upward displacement of lower fragment. In the Surgical Out-Patient Department an attempt was made with the Thomas wrench to correct the deformity. This resulted in an additional fracture three inches above the styloid process and the original lesions remained unchanged. He was admitted to the hospital and operated upon by Dr. Burrell in the manner described above. Only the original radial fracture needed osteotomy. Healing by first intention. Splints were continued for nine weeks. Three months after discharge the condition was as follows: "Moderate silver-fork deformity and moderate abduction of hand. Relative position of styloid processes normal. There is a dorsal callus corresponding to the first row of carpal bones, the exact site of which could not be determined clinically. Flexion nearly normal; extension to line of forearm; pronation and supination normal; power of hand about half that of the other. Result is a great improvement over previous condition, but would be poor in a recent Colles' fracture."

Case No. 8. — Boy, twelve years. A few hours prior to entrance to Boston City Hospital this boy fell on the palms of both outstretched hands. He sustained what appeared to be a separation of the lower epiphyses of both bones of each forearm. Under ether these epiphyses were replaced by the house surgeon. In the right arm all deformity disappeared at once; in the left arm the position of the epiphyses was restored, including the relation of the styloid processes, but there appeared to be a loose fragment on the front of the wrist which could not be made to disappear. There was also a deep abrasion on the front of the left wrist.

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The X-ray photograph showed a large bony fragment on the front of the wrist, lying partly in front of the ulna. The epiphyses were normal in appearance and position, and the rarefication of the lower end of the

radial diaphysis showed the origin of the fragment which was pushing the soft parts forward, making a considerable prominence.

It required two weeks for the skin lesions to heal, at the expiration of which time a vertical incision, one inch long, was made on the front of

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the wrist. The tendons were carefully separated so as to expose the fragment, which was removed easily and without disturbing the union at the epiphyseal line, which was fairly firm. The wound healed by first intention.

The right wrist splints were removed in three weeks, when the position and function were practically perfect. The splints were removed from the left wrist in four weeks. No deformity persisted. From the outset the motions at the left wrist were much restricted, and this limitation of motion did not disappear entirely for six weeks. Eventually the function of both wrists was perfect, and there was no deformity.

Case No. 9. — Girl, ten years. Four weeks ago this patient fell, injuring left wrist. She received treatment, but examination at entrance to Boston City Hospital showed a characteristic silver-fork deformity. Although the function was fairly good, it seemed wise to correct the deformity. X-ray showed that we had to do with a fracture at the epiphyseal line, but there was a considerable fragment broken off the posterior aspect of the lower end of the radial diaphysis. This remained attached to the radial epiphysis. The chief displacement of the lower fragment was backward.

Through the radial incision the line of fracture was exposed and the lower fragment freed easily. Healing was by first intention. Union was firm in three weeks. There were no remaining clinical signs of fracture. Patient regained the normal function rapidly.

Case No. 10. — Man, thirty-five years, conductor. Thrown from car to street thirteen weeks ago, sustaining contusion of head with cerebral concussion, dislocation of left thumb and a right Colles' fracture. All lesions treated at the time. Result of wrist treatment was not satisfactory, for a marked deformity persisted and the function of the wrist was poor. The deformity was chiefly bony because the swelling had subsided. X-ray showed considerable displacement of lower radial fragment backward, outward and upward. Lower end of ulna was prominent. Adduction was much limited; union was firm.

Through the radial incision the lower fragment was easily freed at the line of union. As is always the case, the backward displacement can be corrected when the lower fragment is freed, even though the fracture be many weeks old. It is always more difficult to overcome the displacement of the lower end of ulna. If the fracture is operated before the expiration of six to eight weeks, it is usually possible to correct the ulnar deformity; after that time it is impossible to correct this deformity without further interference. This is due to the fact that adhesions have formed about the fragments and the radio-ulnar articulations and because of contractions and adhesions between soft parts. This deformity, however, can be corrected largely by shortening the shaft of the ulna. For this purpose an incision was made over the shaft of the ulna at the junction of the lower and middle quarters, and by means of a chain saw a one-quarter inch section was removed and the ends of the fragments held with a wire suture. Wounds were closed and anterior and posterior splints applied. The tourniquet which had been applied to the upper arm was not removed until after the dressing and splints had been applied.

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Healing was by first intention. The external appearance of the arm was much improved; the position of the bones is shown in the radiograph. It is only a week since operation, hence the end result cannot be reported. In this instance alone there followed sensory and motor disturbance from tourniquet pressure, but this will disappear in time. The duration of pressure was about one hour. The tourniquet was applied to the upper arm.

CONCLUSIONS.

1. Fractures at the lower end of the radius are very common lesions. As a result of neglect on the part of the patient, or oversight or otherwise on the part of the physician, the final result is frequently unsatisfactory either from the standpoint of function or appearance, or both.

2. Appropriate treatment applied early should give as good a result as could be obtained in any given case; therefore subsequent operation is not indicated.

3. In cases where the final result is not satisfactory, surgical interference of some sort is usually indicated.

4. During the first three weeks whatever union has taken place can usually be broken up by manipulation under an anesthetic, and suitable apparatus should then be applied as for a recent fracture.

5. After the third or fourth week the best results are obtained by means of an osteotomy in the line of fracture, followed by treatment appropriate for a recent fracture.

6. In fractures which have existed for from two to six months osteotomy should always improve the position and frequently improves the function, although special consideration should be given each case.

7. After the expiration of six months it is more difficult to correct the deformity. The backward and upward displacement of the lower fragment can always be overcome, but the correction of the lateral displacement is more difficult and usually requires an osteotomy of the ulna. The function is rarely improved at this time. Hence interference should be limited to selected cases.

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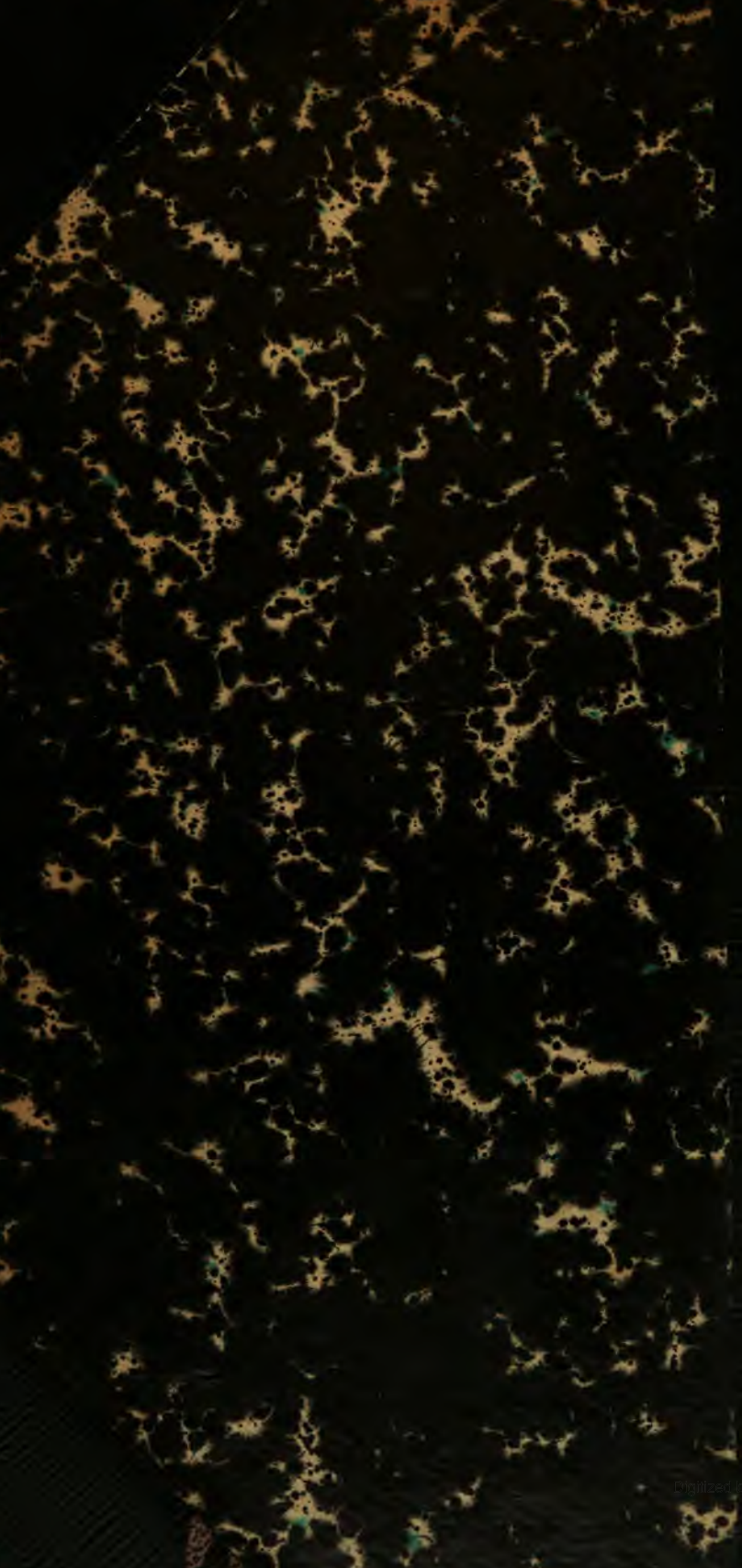
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